

T A B L E O F C O N T E N T S

Section

Coordinates

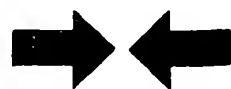
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SPECIAL FEATURES

BMW 3.0 Si with control unit no.
0 280 001 104 (9.75 until 3.77)
BMW 3.3 Li with control unit no.
0 280 001 103 (9.75 until 3.77)
BMW 633 CSi with control unit no.
0 280 001 103 (9.75 until 9.77)

- Control unit with switch-operated output stage and series resistors
- The post-start relay directs the electrical start valve until the thermotime switch has cut out, regardless of how long one activates the starting switch.
- When the throttle valve is closed, the vacuum limiter limits the vacuum in the intake manifold.
- The auxiliary air device is heated by the cooling water.



RAPID DIAGNOSTIC CHART FOR THE UNIVERSAL TEST ADAPTER

- Universal test adapter 0 684 101 801
and
- Adapter lead 1 684 463 129

The rapid diagnostic chart includes the following information

- Switch settings on the universal test adapter
- Sequence of test steps
- Comments on the operation of the universal test adapter or other components.
- Readings on the multimeter
- Cross-references to coordinates for the detailed testing and trouble-shooting program needed in each instance.

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Rapid diag. chart for univers. test adap.
BMW 3.0 Si, 3.3 Li, 633 CSi



Rapid diagnostic chart for the universal test adapter

<u>Test step</u>	<u>Switch setting</u>		<u>Measurement</u>	<u>Note</u>	<u>Test specifications (reading)</u>
	V	Ω			
1	3	-	Voltage from starting motor Term. 50. Control unit plug Term. 4 to Term. 5	Put into neutral, start engine.	<u>8 ... 15 V</u>
2	5	-	Voltage impulse from ignition coil Term. 1 Control unit plug Term. 1 to Term. 5	Put into neutral, start engine	Ignition impulse on oscilloscope
3	6	-	Voltage from relay set Term. 88a. Control unit plug Term. 10 to Term. 5	Ignition "ON"	<u>8 ... 15 V</u>
4	7	-	Voltage from first electric fuel-injection valve Term. 15. Control unit plug Term. 15 to Term. 5.	Ignition "ON"	<u>8 ... 15 V</u>
5	8	-	Voltage from the second electric fuel-injection valve Term. 33. Control unit plug Term. 33 to Term. 5.	Ignition "ON"	<u>8 ... 15 V</u>
6	9	-	Voltage from the third electric fuel-injection valve Term. 32 Control unit plug Term. 32 to Term. 5	Ignition "ON"	<u>8 ... 15 V</u>
7	10	-	Voltage from the fourth electric fuel-injection valve Term. 14 Control unit plug Term. 14 to Term. 5.	Ignition "ON"	<u>8 ... 15 V</u>
8	11	-	Voltage via pump contact in the air-flow sensor from the relay set Term. 86b. Control unit plug Term. 20 to Term. 5.	Ignition "ON"	<u>8 ... 15 V</u>
9	13	-	Voltage from the fifth electric fuel-injection valve Term. 30 Control unit plug Term. 30 to Term. 5	Ignition "ON"	<u>8 ... 15 V</u>
10	14	-	Voltage from the sixth electric fuel-injection valve Term. 31. Control unit plug Term. 31 to Term. 5.	Ignition "ON"	<u>8 ... 15 V</u>

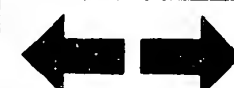
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Rapid diag. chart for univers. test adap.
BMW 3.0 Si, 3.3 Li, 633 CSi













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Rapid diag. chart for univers. test adap.
BMW 3.0 Si, 3.3 Li, 633 CSi



Rapid diagnostic chart for the universal test adapter

Test step	Switch setting		Measurement	Note	Test specifications (reading)
	V	Ω			
11		6	Resistance of the potentiometer (wiper) in the air-flow sensor Term. 7. Control unit plug Term. 7 to Term. 5.	Deflect air-flow sensor flap as far as the stop	$40 \dots 300 \Omega$ $80 \dots 600 \Omega$ 1
12		7	Resistance of the potentiometer (total resistance) in the air-flow sensor Term. 8 Control unit plug Term. 8 to Term. 5.	----	$130 \dots 260 \Omega$ $260 \dots 520 \Omega$ 1
13		8	Series resistance and potentiometer-total resistance in the air-flow sensor Term. 9.	----	$200 \dots 400 \Omega$ $400 \dots 800 \Omega$ 1
14		9	Resistance of the idle contact in the throttle-valve switch Term. 2. Control unit plug Term. 2 to Term. 18.	Accelerator pedal at rest position: Step down lightly on accel.:	$0 \dots 10 \Omega$ $\infty \Omega$
15		10	Resistance of the full-load contact in the throttle-valve switch Term. 3 Control unit plug Term. 3 to Term. 18.	Step all the way down on the accelerator (full load pos.): Step lightly on accel.	$0 \dots 10 \Omega$ $\infty \Omega$
16		11	Resistance of temperature sensor NTC I in the air-flow sensor Term. 27. Control unit plug Term. 27 to Term. 5	----	at $+15^{\circ}\text{C} \dots +30^{\circ}\text{C}$ $1.45 \dots 3.3 \text{ k}\Omega$ at $+80^{\circ}\text{C}$: $280 \dots 360 \Omega$
17		12	Resistance of temperature sensor NTC II Term. 13 (engine temperature). Control unit plug Term. 13 to Term. 5.	----	at $+15^{\circ}\text{C} \dots +30^{\circ}\text{C}$ $1.3 \dots 3.6 \text{ k}\Omega$ at $+80^{\circ}\text{C}$: $250 \dots 390 \Omega$
18		13	Resistance ground - output stage Term. 16. Control unit plug Term. 16 to Term. 5.	----	$0 \dots 10 \Omega$
19		14	Resistance ground - output stage Term. 17. Control unit plug Term. 17 to Term. 5.	----	$0 \dots 10 \Omega$
20		15	Resistance ground - output stage Term. 35. Control unit plug Term. 35 to Term. 5.	----	$0 \dots 10 \Omega$

1) as of FD 049

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Rapid diag. chart for univers. test adap.
BMW 3.0 Si, 3,3 Li, 633 CSi



A7

Rapid diag. chart for univers. test adap.
BMW 3.0 Si, 3.3 Li, 633 CSi



TEST SPECIFICATIONS

- Pressure regulator
Fuel pressure: 2.3 ... 2.7 bar

- Electric fuel pump
Delivery at the return: min. 875 cm³/30s
Connection voltage under load: min. 12 V

● Thermotime switch (15°/8s):			
Internal electrical resistance	Between Term. "G" and ground	Between Term. "W" and ground	Between Term. "G" and "W"
Ambient temperature (less than +10°C)	50...70 Ω	0 Ω	50...70Ω
Engine at normal operating temperature (above +20°C)	50...70 Ω	∞ Ω	∞ Ω

- Electric start valve
internal electrical resistance: 3.5...4.5 Ω
leakage: max. allowable 1 drop per minute

● Temperature sensors	NTC I (in-take air)	NTC II (engine)
Internal electrical resistance at ambient temperature (+15 ...+30°C)	1.45...3.3 kΩ	1.3...3.6 kΩ
Engine at normal operating temp. (approx. +80°C):	280...360 Ω	250...390 Ω



● Air-flow sensor	Series	As of FD 049
Term. 6 to Term. 9:	200 ... 400 Ω	400 ... 800 Ω
Term. 6 to Term. 8:	130 ... 260 Ω	260 ... 520 Ω
Term. 6 to Term. 7:	40 ... 300 Ω^*	80 ... 600 Ω^*
Term. 7 to Term. 8:	100 ... 500 Ω^*	200 ... 1000 Ω^*
Term. 8 to Term. 9	70 ... 140 Ω	140 ... 280 Ω

● Electric fuel-injection valve

Internal electrical
resistance at + 20°C: 2.0 ... 3.0 Ω

● Series resistance

Resistance value for each
individual resistor: 5 ... 7 Ω

● Idle adjustment (engine at normal operating temperature, approx. + 80°C)

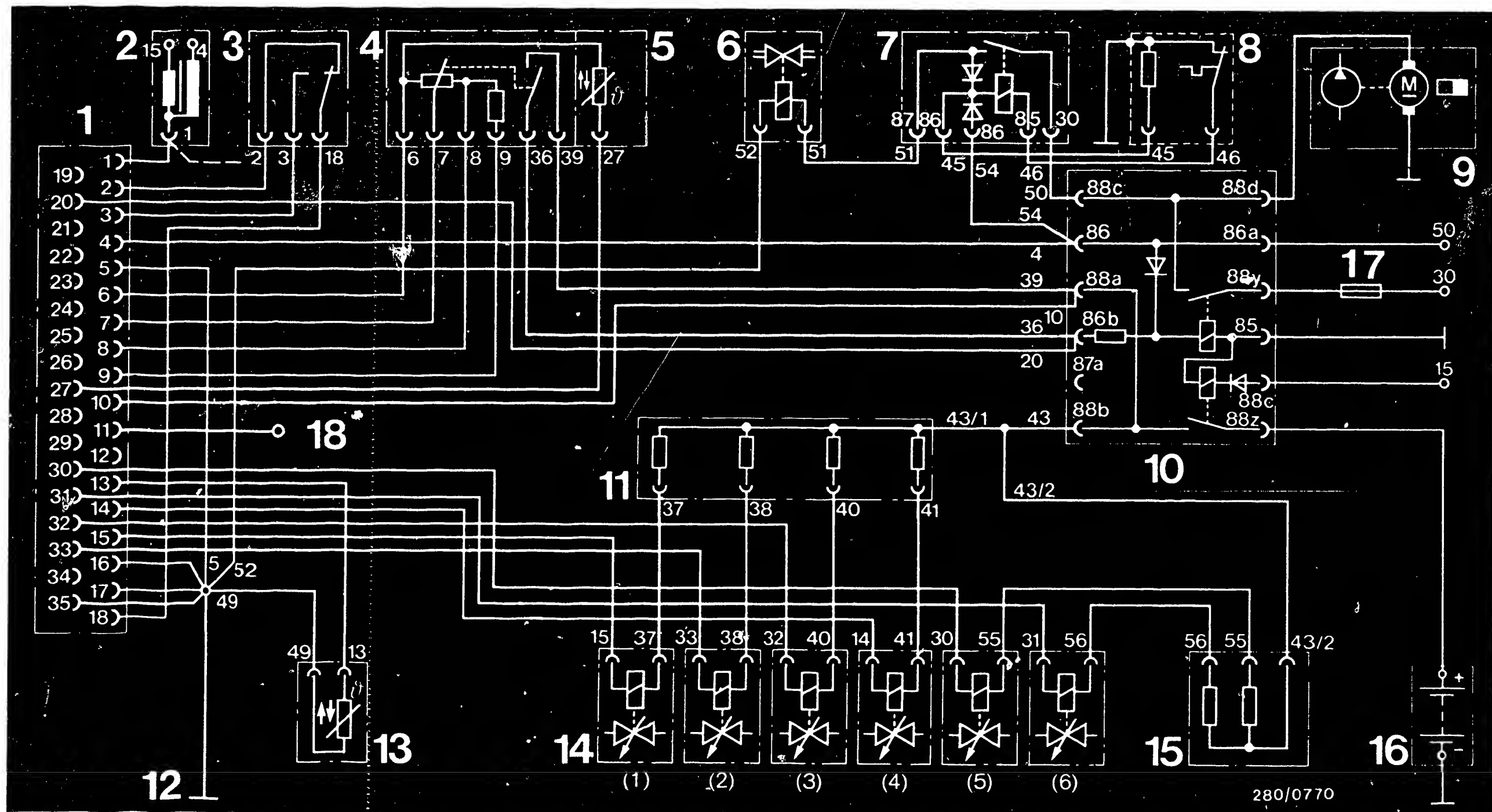
Idle speed: 850 ... 950 min⁻¹

CO-adjustment: 1.0 ... 2.5 vol%CO

For settings for ignition, valve clearance, and other engine data, see Equipment and Autodata microfiche.

* Deflect air-sensor flap all the way.





ELECTRIC TERMINAL DIAGRAM

1 = Control unit plug
2 = Ignition coil
3 = Throttle-valve switch
4 = Air-flow sensor

5 = Temperature sensor (air)
6 = Electric start valve
7 = Post-start relay
8 = Thermotime switch
9 = Electric fuel pump

10 = Relay set
11/15 = Series resistors
12 = Central ground
13 = Temperature sensor II (engine)

14 = Electric fuel-injection valves
16 = Battery
17 = Pump fuse
18 = Measurement outlet

A10

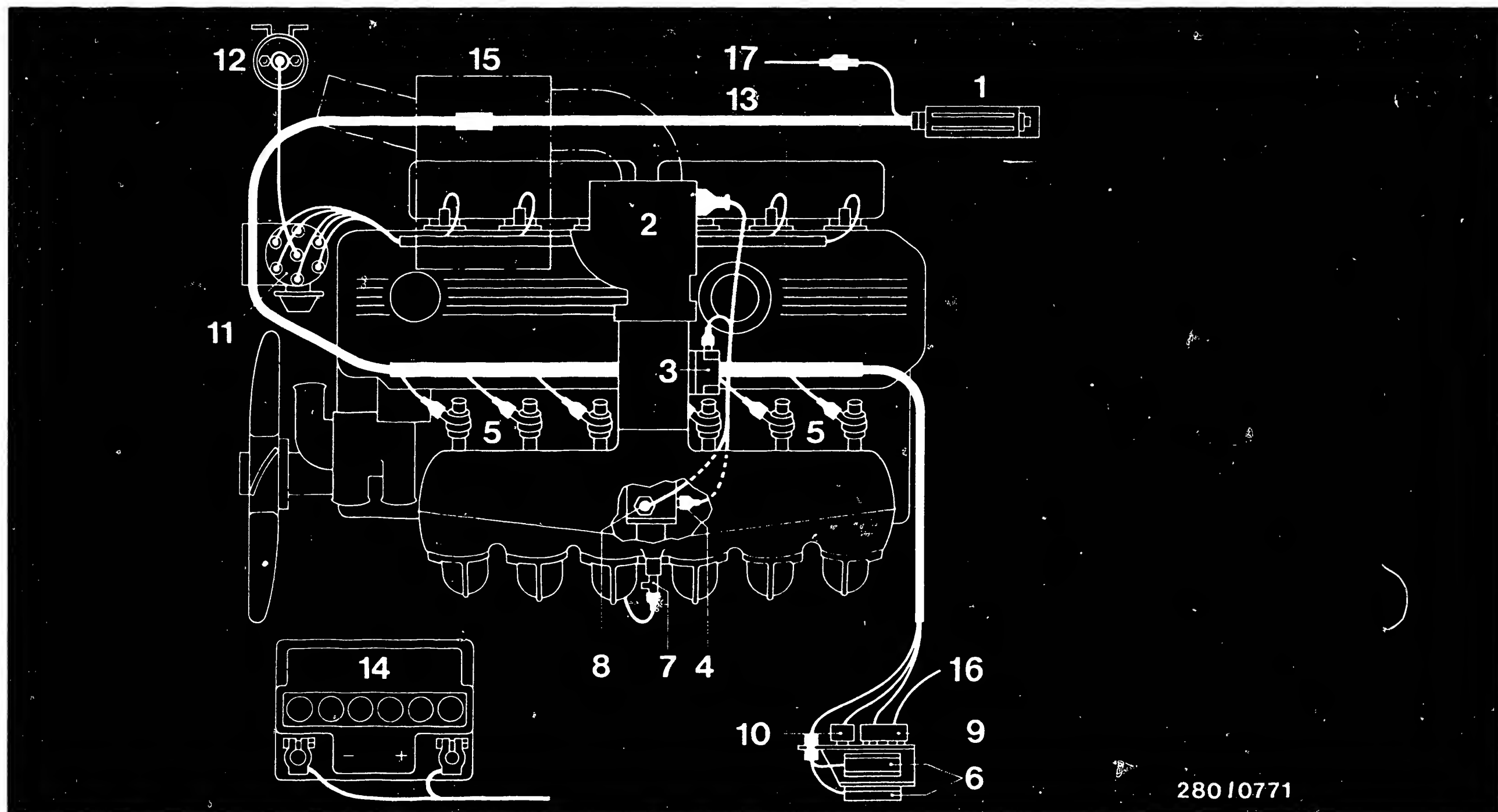
Electric terminal diagram
BMW 3.0 Si, 3.3 Li, 633 CSi



A11

Electric terminal diagram
BMW 3.0 Si, 3.3 Li, 633 CSi





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ELECTRIC WIRING DIAGRAM AND ARRANGEMENT OF THE COMPONENTS

- | | | | |
|------------------------------------|--------------------------|------------------------------|-----------------------------|
| 1 = Control unit | 6 = Series resistor | 11 = Ignition distributor | 15 = Air filter |
| 2 = Air-flow sensor | 7 = Electric start valve | 12 = Ignition coil | 16 = Vehicle wiring harness |
| 3 = Throttle-valve switch | 8 = Thermotime switch | 13 = Jetronic wiring harness | 17 = to ignition coil |
| 4 = Temperature sensor II | 9 = Relay set | 14 = Battery | |
| 5 = Electric fuel-injection valves | 10 = Post-start relay | | |

A12

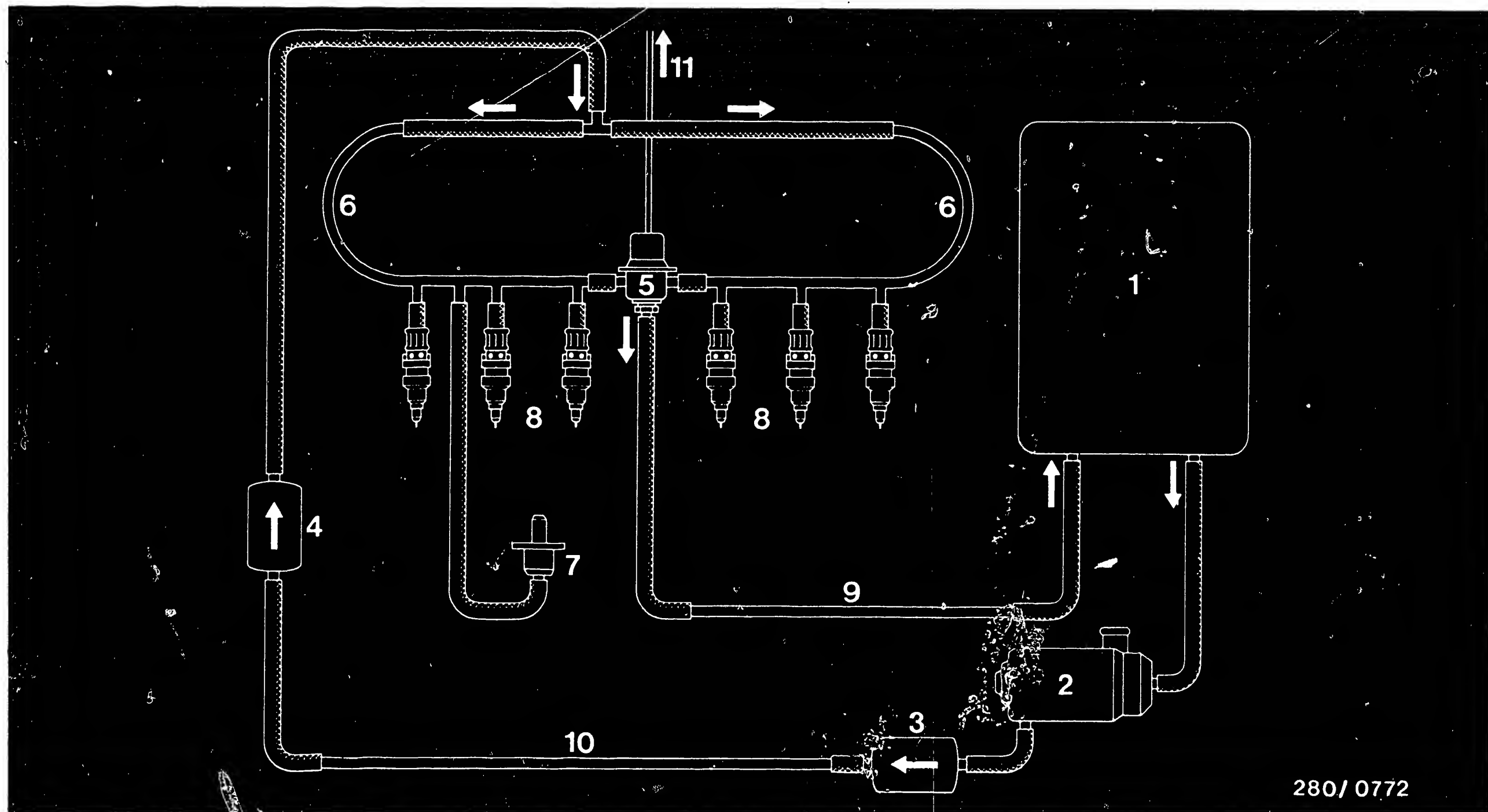
Electrical wiring diagram
BMW 3.0 Si, 3.3 Li, 633 CSi



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Electrical wiring diagram
BMW 3.0 Si, 3.3 Li, 633 CSi





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FUEL LINE DIAGRAM

- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Expansion vessel
- 4 = Fuel filter
- 5 = Pressure regulator

- 6 = Fuel distribution pipe
- 7 = Electric start valve
- 8 = Electric fuel-injection valves
- 9 = Fuel return line
- 10 = Fuel supply line

11 = to the intake manifold
The supply line and the return line run back to the fuel tank under the floor on the left side

A14

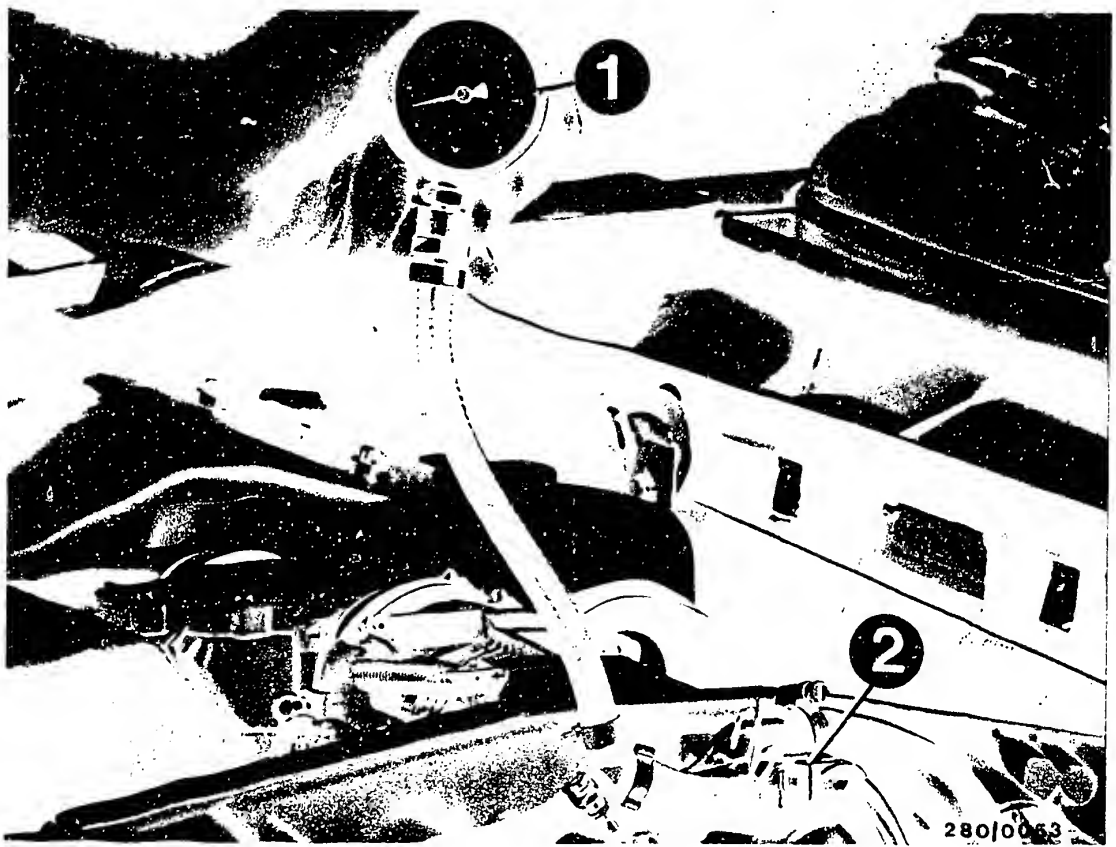
Fuel line diagram
BMW 3.0 Si, 3.3 Li, 633 CSi



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Fuel line diagram
BMW 3.0 Si, 3.3 Li, 633 CSi



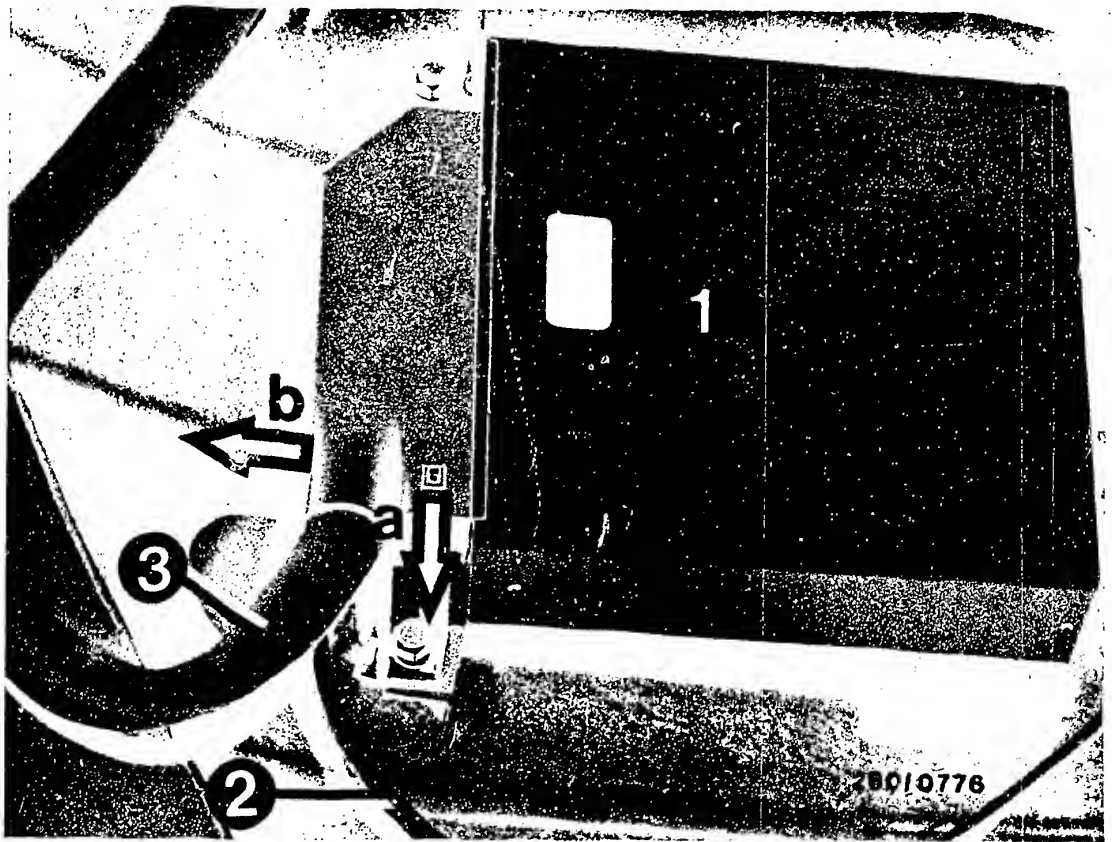


- 1 = Pressure gauge 1 687 321 154
2 = Electric start valve

CHECKING FUEL PRESSURE

Disconnect hose on the electric start valve (2). Connect pressure gauge. Make certain connections do not leak! Do not damage the electric start valve when pulling off and putting on the fuel hose.





- 1 = L-Jetronic control unit
- 2 = Lead from ignition coil Term. 1 to control unit Term. 1
- 3 = Jetronic wiring harness
- a = Detent
- b = Swing plug away in the direction of the arrow

INSTALLATION POSITION OF THE COMPONENTS

Control unit: At the right under the back seat in the passenger compartment.



Electric fuel pump: Under the vehicle, in front of the fuel tank.

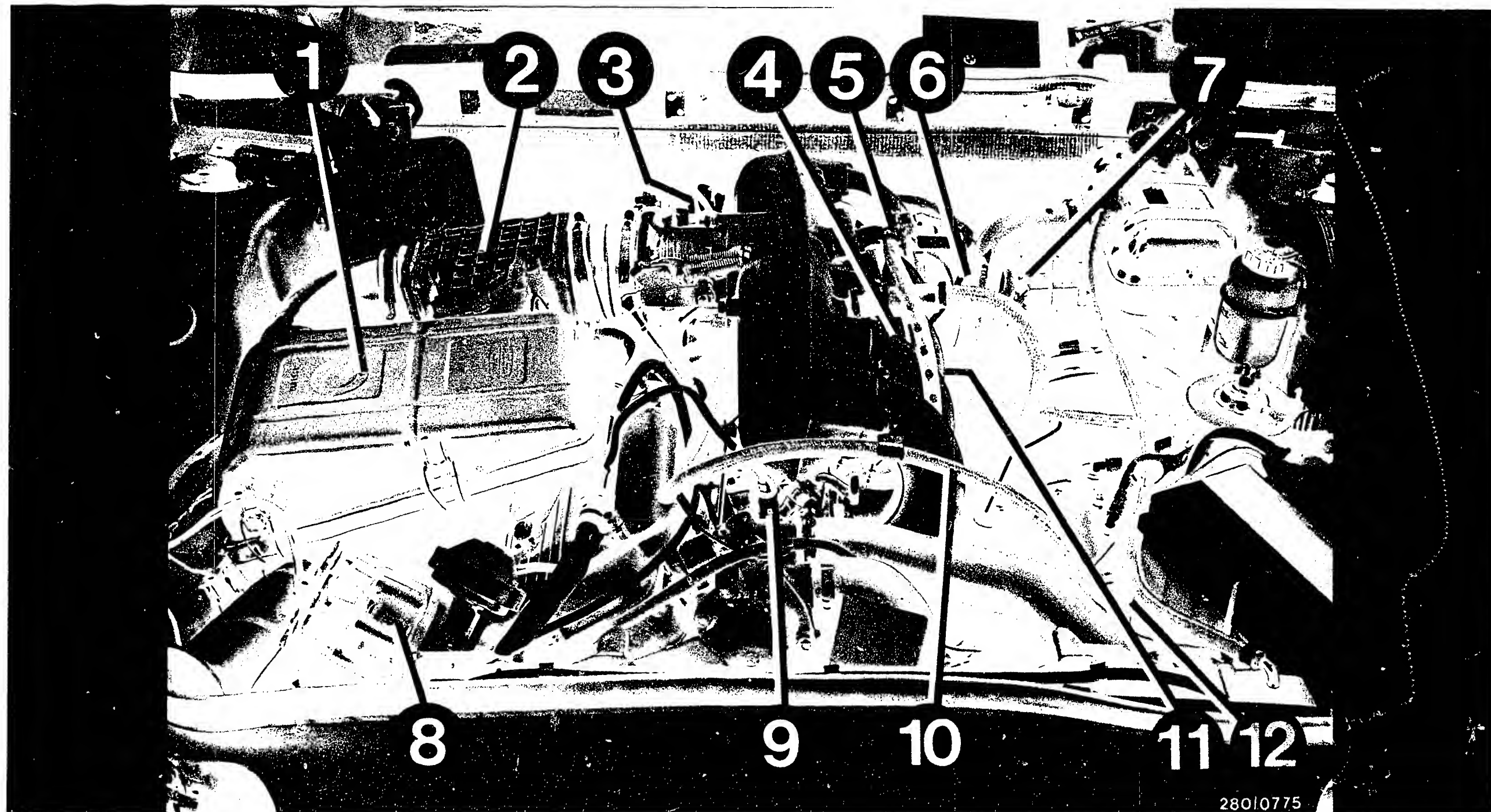
Pump fuse: In the engine compartment in the central fuse box (fuel pump)

A18

Installation position of components

BMW 3.0 Si, 3.3 Li, 633 CSi





- 1 = Air filter
- 2 = Air-flow sensor
- 3 = Throttle-valve switch;
under that, idle-air
screw
- 4 = Pressure regulator

- 5 = Electric start valves
- 6 = Relay set and post-start relay
- 7 = Series resistors
- 8 = Ignition distributor
- 9 = Electric fuel-injection valve

- 10 = Fuel supply line
- 11 = Temperature sensor, thermotime
switch and auxiliary air device
- 12 = Fuel filter

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Installation position of components
BMW 3.0 Si, 3.3 Li, 633 CSi



A20

Installation position of components
BMW 3.0 Si, 3.3 Li, 633 CSi



T A B L E O F C O N T E N T S

Section

Coordinates

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1. Test specifications

Due to considerations of safety, the ABS is to be tested only using the ABS tester. The rapid diagnostic chart contains all important test specifications and instructions for testing and for trouble-shooting.

2. PREREQUISITES FOR TESTING WITH THE ABS TESTER

- The tester must be converted to the most recent technical status (identification "U2" on the type designation plate or built after FD 352).
- Check the ground connection of the return pump and the overvoltage protection relay Term. 31 for firm seat and corrosion.
- Check hydraulic connections and seals on the hydraulic modulator for leaks (visual inspection).
- If the ABS signal light comes on from time to time during the trip (e.g., after switching-on load instruments) and goes back off on its own, check the battery and the power supply (alternator, controller, and voltage drops).
- If the ABS signal light is on continuously and does not go out, check the following points:
 - Is the multi-pole plug on the controller properly seated, and has it caught?
Are all plug contacts OK?
Are spring contacts latched in place?
 - Is the V-belt torn? (The alternator does not provide any voltage, the charge indicator light and the ABS signal light turn on).
 - Is alternator Term. 61 providing voltage?
Are the plug connection and the lead to the ABS controller OK?
 - Check for loose contacts for the wheel speed sensors with the program switch in setting 10.



- To test with the tester, switch the ignition on in all program switch settings (tester operates using the power supply from the vehicle battery).
- Watch tester lights 1 and 2 in all settings of the program switch.

N.B.!

Do not drive with the tester connected to the vehicle!

The entire testing program is to be repeated after every repair.

General instruction for trouble-shooting

Check all leads for grounding and contact with + leads and watch for worn or crimped spots.

- Connect the ABS tester to the controller and ABS wiring harness.

N.B.!

Disconnect and plug in the controller only with the ignition switched off.

The installation location for the controller is behind a cover in the glove compartment. Take out the Jetronic control unit if there is one there.



3. RAPID DIAGNOSTIC CHART FOR THE ABS TESTER

Switch the ignition on in all settings of the program switch.

<u>Program switch setting</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specification (Reading)</u>	<u>Cause of defect</u>
1...24	Power supply for each test step	----	Light 1 (green) must light up in every test step	<ul style="list-style-type: none"> • Charge on battery inadequate. Repeat test step with engine running. • Too great voltage drops at the terminals (e.g. ground terminal). • Ground connection broken.
1	Valve relay at rest	----	Light 1 (green) and light 3 (green) must light up.	<ul style="list-style-type: none"> • Leads (including ground lead) to the valve relay have a break or have excessive contact resistance. • Valve relay defective.
2	Valve relay - operation	----	Lights 1 (green) and 3 (green) must light up.	
3	Return-pump relay - at rest	----	Lights 1 (green) and 3 (green) must light up.	<ul style="list-style-type: none"> • Leads to the return-pump relay have breaks or have too great a contact resistance. • Return-pump relay defective. • Check pump motor for continuity.
4	Return-pump relay - operation	Press the illuminated button	Lights 1 (green) and 3 (green) must light up, pump motor runs	

B4

Rapid diagnostic chart

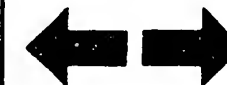
BMW, 5 series



B5

Rapid diagnostic chart

BMW, 5 series

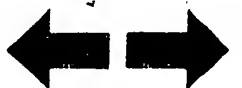


<u>Program switch setting</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specification (reading)</u>	<u>Cause of defect</u>
5	Overvoltage protection in the controller	Pull the overvoltage protection out of the test socket that is located on the back of the ABS tester. Press the illuminated button.	Lights 1 (green) and 3 (green) must light up.	<ul style="list-style-type: none"> ● Repeat test. ● Controller defective.
6	Internal resistances of the solenoid-operated valves in the hydraulic modulator	Switch ignition off. Connect controller. Switch ignition on. Press button VL Press button VR Press button HL Press button HR	Light 1 (green) must light up. VL: 0.7...1.7 Ω VR: 0.7...1.7 Ω HL: 0.7...1.7 Ω HR: 0.7...1.7 Ω	<ul style="list-style-type: none"> ● Leads to the valve in question have breaks or have excessive contact resistance ● Hydraulic modulator defective.
7	Ground connection to Term. 10	Press illuminated button	Light 1 (green) must light up. 30...300 mV	<ul style="list-style-type: none"> ● Ground connection or ground terminal have breaks or have excessive contact resistance.
8	Ground connection to Term. 34	Press illuminated button	Light 1 (green) must light up. 10...250 mV	
9	Ground connection to Term. 20	Press illuminated button	Light 1 (green) must light up. 10...250 mV	

B6

 Rapid diagnostic chart
 BMW, 5 series

B7

 Rapid diagnostic chart
 BMW, 5 series


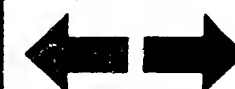
<u>Program switch setting</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specification (reading)</u>	<u>Cause of defect</u>
10	Internal resistances of the wheel speed sensors	Press button VL Press button VR Press button HL Press button HR	Light 1 (green) must light continually. VL: 0.8...1.8 kΩ VR: 0.8...1.8 kΩ HL: 0.6...1.6 kΩ HR: 0.6...1.6 kΩ	<ul style="list-style-type: none"> • Check for loose contact: Move all leads at their fastening points, on the plug and on the wheel speed sensor and watch the reading. • The leads to the wheel speed sensor in question have breaks or have excessive contact resistance. • The wheel speed sensor in question is defective
11	Insulation resistances of the wheel speed sensors	Press button VL Press button VR	Light 1 (green) must light up continually. VL: 20...999 kΩ VR: 20...999 kΩ HL: 20...999 kΩ HR: 20...999 kΩ	<ul style="list-style-type: none"> • Check leads to the wheel speed sensor in question or damage to the insulation. • Wheel speed sensor in question is defective.
12	DC voltage on the wheel speed sensor leads	Press button VL Press button VR Press button HL Press button HR	Light 1 (green) must light up continually. VL: 000...100 mV VR: 000...100 mV HL: 000...100 mV HR: 000...100 mV	<ul style="list-style-type: none"> • Check leads to the wheel speed sensor in question for contact (wear spot) with a + lead. • Wheel speed sensor in question is defective.
13	Internal power supply within controller	Press illuminated button	8.85...9.15 V For generation 2B after 9.83: 4.75...5.25 V	<ul style="list-style-type: none"> • Controller defective.

B8

Rapid diagnostic chart
BMW, 5 series


B9

Rapid diagnostic chart
BMW, 5 series



<u>Program switch setting</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specifications (reading)</u>	<u>Cause of defect</u>
14	Diode in forward direction and ABS signal light		0.4...1.5 V ABS signal light in the vehicle must light up.	<ul style="list-style-type: none"> Leads to the diode and/or the signal light have breaks or contact resistance. Signal light defective. Diode (hydraulic moderator) defective.
15	Diode in blocking direction		2.5...8.5 V ABS signal lights somewhat more dimly.	<ul style="list-style-type: none"> Diode (hydraulic modulator) defective.
16	Controller BITE* triggering	Press illuminated button for 3 seconds	Signal light must go off after max. 1 second.	<ul style="list-style-type: none"> Controller defective.
17	Controller, BITE*-simulation of defect	Press illuminated button for 3 seconds	Signal light must stay on (flickering allowable).	<ul style="list-style-type: none"> Controller defective.
18	Controller, current for maintaining pressure	Press button VL, press illuminated button Press button VR, press illuminated button Press button HL, press illuminated button Press button HR, press illuminated button	VL: 1.9...2.3 A VR: 1.9...2.3 A HL: 1.9...2.3 A HR: 1.9...2.3 A	<ul style="list-style-type: none"> Controller defective.
19	Controller, current for pressure reduction	Press button VL, press illuminated button Press button VR, press illuminated button Press button HL, press illuminated button Press button HR, press illuminated button	VL: 4.5...6.0 A VR: 1.9...2.3 A HL: 4.5...6.0 A HR: 4.5...6.0 A	<ul style="list-style-type: none"> Controller defective
24	Voltage from brake light switch	Step on brake pedal	Only for generation 2B after 9.83: 10...15 V	<ul style="list-style-type: none"> Lead to the brake light switch defective. Brake light switch defective. Brake lights defective.

*BITE = Built-in test circuit

B 10

Rapid diagnostic chart
BMW, 5 series



B 11

Rapid diagnostic chart
BMW, 5 series



A brake analyzer (BTS) is required for program switch settings 20, 21, 22, and 23.
Do not drive the vehicle with the tester connected! Do not use a brake pedal actuator to adjust the brake force! Be certain to do program switch setting 23 first.

Front axle

Drive vehicle with front wheels on the brake analyzer. Put on hand brake.

<u>Program switch setting</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specifications (reading)</u>	<u>Cause of defect</u>
23	Wheel speed sensors - checking signal and that sensors have not been exchanged one for the other	Press button VL, switch on left brake roller.	<u>VL: 1.2...19</u>	<ul style="list-style-type: none"> • Have wheel speed sensors been exchanged for one another? • Air gap too large. • Wheel speed sensor in question is defective.
		Press button VR, switch off left brake roller, switch on right brake roller.	<u>VR: 1.2...19</u>	
20	Hydraulic modulator - checking pressure reduction and for mistaken connections	Press button VR. Switch on right brake roller. Step on brake pedal and hold constant at 2000 N. Press illuminated button.	<u>VR: 500...1000 N</u>	<ul style="list-style-type: none"> • Final test reading may vary by max. 200 N in 3 seconds. • Have brake leads been mistaken for one another? • Is conventional brake system OK? • Hydraulic modulator defective. <p><u>Note:</u> Take out and replace the hydraulic modulator only as a complete unit. Repair is not allowable. Danger! Can be fatal!</p>
		Press button VL. Switch off right brake roller. Switch on left brake roller. Step on brake pedal and hold constant at 2000 N. Press illuminated button.	<u>VL: 500...1000 N</u>	
21	Hydraulic modulator - pressure build-up	Press button VL, switch on both brake rollers. Step on brake pedal and hold constant at 2000 N. Allowable difference between the two wheels max. 400 N. Press illuminated button.	Reading on the brake analyzer on the left goes to an interim value and then increases again to <u>VL: 600...1400 N</u>	

B 12

Rapid diagnostic chart

BMW, 5 series



B 13

Rapid diagnostic chart

BMW, 5 series



Program switch setting	Testing of	Additional operation	Test specifications (reading)	Cause of defect
21	Hydraulic modulator - pressure build-up	Press button VR. Switch on both brake rollers. Step on brake pedal and hold constant at 2000 N. Press illuminated button.	Reading of the brake analyzer on the right goes to an interim value and then increases again to <u>VR: 600...1400 N</u>	<ul style="list-style-type: none"> • The final test reading may vary by max. 400 N in 3 seconds. • Have brake leads been exchanged for one another? • Is conventional brake system OK? • Hydraulic modulator is defective. <p>Note: Take out and replace the hydraulic modulator only as a complete unit. Repair is not allowable. Danger! Can be fatal!</p>
22	Hydraulic modulator - pump delivery, first brake circuit	Switch on brake rollers. Read the intrinsic friction value on the right. Press button VR. Step on brake pedal and hold constant at 2000 N. Press illuminated button.	After an interim value on the right, the return pump switches on briefly. The reading on the right must drop below the <u>intrinsic friction value plus 200 N</u> . Keep pressing the illuminated button until the reading rises again to 2000 N.	<ul style="list-style-type: none"> • Hydraulic modulator defective. <p>Note: Take out and replace the hydraulic modulator only as a complete unit. Repair is not allowable. Danger! Can be fatal!</p>
	Hydraulic modulator - pump delivery, second brake circuit	Switch on brake rollers. Read the intrinsic friction value on the left. Press button VR. Step on brake pedal and hold constant at 2000 N. Press illuminated button.	After an interim value on the left, the return pump switches on briefly. The reading on the left must drop below the <u>intrinsic friction value plus 200 N</u> . Keep pressing the illuminated button until the reading rises again to 2000 N.	



Rear axle: Drive vehicle with the rear wheels on the brake analyzer. Release the hand brake.
For vehicles with automatic transmissions, put into neutral.

Program switch setting	Testing of	Additional operation	Test specifications (reading)	Cause of defect
23	Wheel speed sensors - checking signal and that sensors have not been exchanged one for the other	Press button HL, switch on left brake roller.	HL: 1.2...19	<ul style="list-style-type: none"> • Have wheel speed sensors been exchanged for one another? • Air gap too large. • Wheel speed sensor in question is defective.
		Press button HR, switch off left brake roller, switch on right brake roller.	HR: 1.2...19	
20	Hydraulic modulator - pressure reduction and checking for mistaken connections	Press button HR. Switch on right brake roller. Step on brake pedal and hold constant at 1500 N. Press illuminated button.	HR: 500...1000N *) 400...900 N **)	<ul style="list-style-type: none"> • Final test reading may vary by max. 200 N in 3 seconds. • Have brake leads been mistaken for one another? • Is conventional brake system OK? • Hydraulic modulator defective. <p>Note: Take out and replace the hydraulic modulator only as a complete unit. Repair is not allowable. Danger! Can be fatal!</p>
		Press button HL. Switch off brake roller. Switch off left brake roller. Step on brake pedal and hold constant at 1500 N. Press illuminated button.	HL: 500...1000N *) 400...900 **)	
21	Hydraulic modulator - pressure build-up	Press button HL. Switch on both brake rollers. Step on brake pedal and hold constant at 1500 N. Allowable difference between the two wheels max. 400 N. Press illuminated button.	Reading on the brake analyzer on the left goes to an interim value and then increases again to HL: 500...1100 N *) 400...1000 N **)	<p>*) Valid for hydraulic modulator 0 265 201 005, which may be installed only in the 528i and 525i (up to 3.82) with a 13° helical suspension rear axle.</p> <p>**) Valid for hydraulic modulator 0 265 201 004, which can be installed in all models of the 5 series.</p>
		Press button HR. Switch on both brake rollers. Step on brake pedal and hold constant at 1500 N. Press illuminated button.	Reading on the brake analyzer on the right goes to an interim value and then increases again to HR: 500...1100 N *) 400...1000 N **)	

Do a test drive as final test. The signal light must go out when the engine is running. Drive at least 30 km/hr. When this is done, the signal light must not come back on.

B 16

Rapid diagnostic chart
BMW, 5 series



B 17

Rapid diagnostic chart
BMW, 5 series

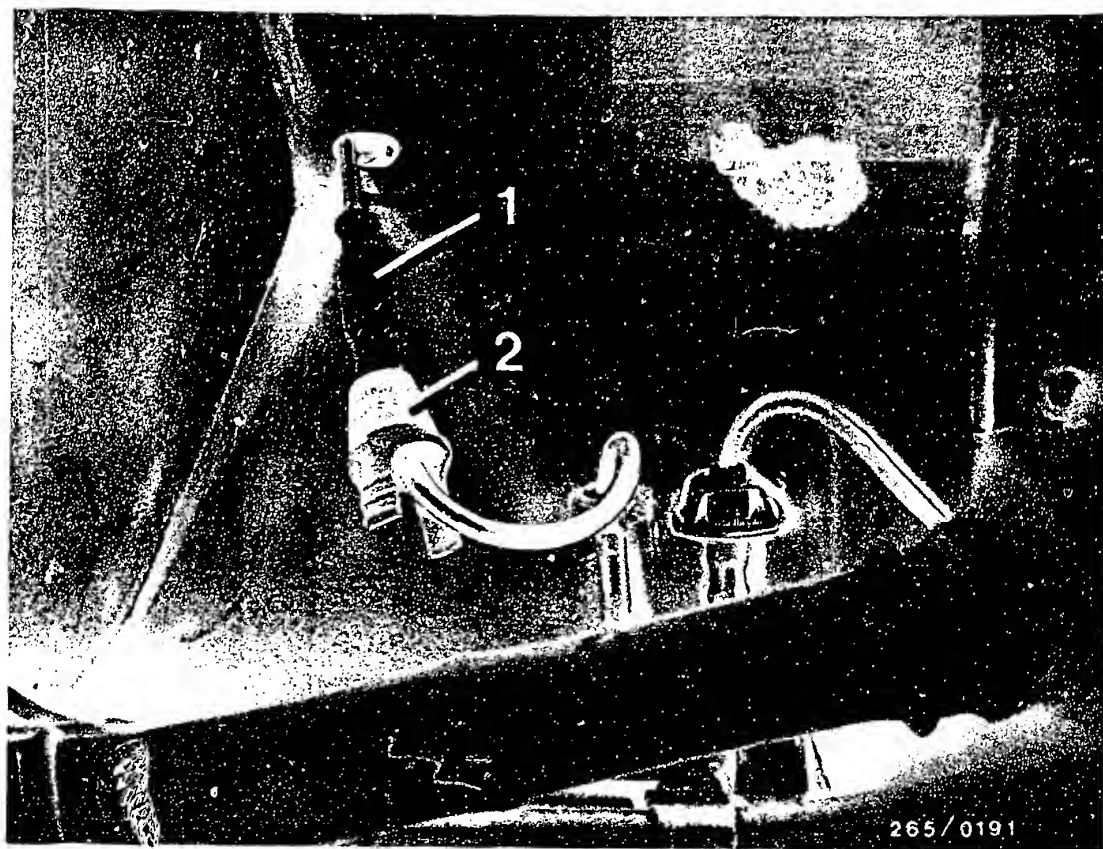


5. INSTALLATION POSITION OF THE COMPONENTS

Indication for installation position is always based on the forward direction of vehicle travel.

- ABS signal light: In the dashboard.
- Ground terminal for ABS: In the engine compartment, left front, near the battery.
- Controller: Behind the cover in the glove compartment. If there is a Jetronic control unit there, take it out.





- 1 = Plug connection for the wheel speed sensor, left rear, pulled out of the hole.
 2 = Rubber grommet

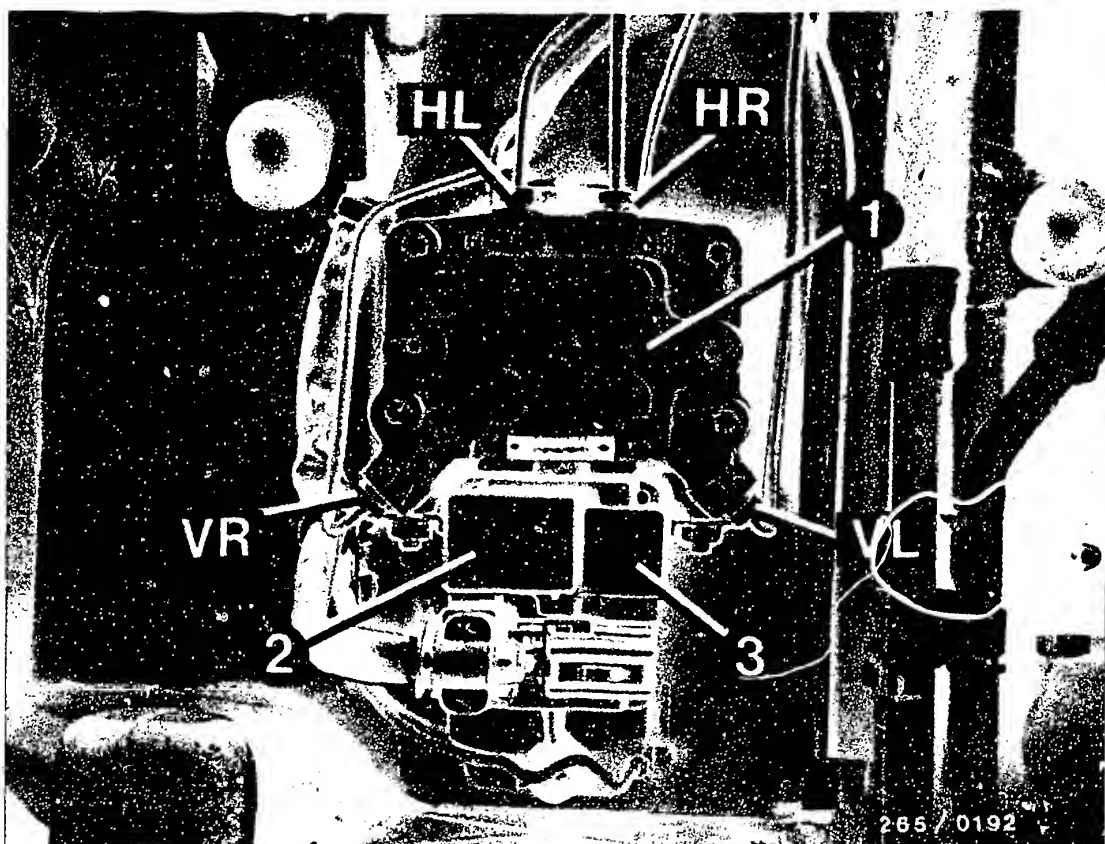
● Wheel speed sensors, front axle:

One each on the left and on the right, in the steering knuckles. The plug connections are located on the left and right in the engine compartment, on the wheel box, in a frame perpendicular to the McPherson struts.

● Wheel speed sensors, rear axle:

One each on the left and on the right near the disc-brake calipers.
 The wheel speed sensors are to be put on without washers. The plug connections are located under the vehicle, in rubber grommets that are inserted into the floor plate (Figure). Pull the rubber grommets out carefully.





1 = Hydraulic modulator

In the engine compartment, behind the right headlight.

VL = Brake line to left front wheel brake cylinder

VR = Brake line to right front wheel brake cylinder

HL = Brake line to left rear wheel brake cylinder

HR = Brake line to right rear wheel brake cylinder

2 = Return-pump relay

3 = Valve relay

It may be necessary to remove the air filter housing before taking out the hydraulic modulator.

Before taking off the cap, disconnect the ground lead from the gap.

It is not permissible to repair the hydraulic modulator. It must be taken out and replaced as a complete unit.

Exception: Replacement of relays.



6. TEST EQUIPMENT AND TOOLS

Name	Designation	Part No.
<u>ABS tester</u> Use only retrofitted testers! Identification "U2" on type designation plate, or built after FD 352	ETT 016.00	0 684 101 600
<u>Brake analyzer</u>	e.g. BPS 100 or BPS 101 or BPS 104 or BPS 105	0 680 012 .. 0 680 013 .. 0 680 018 .. 0 680 019 ..
<u>Charging and bleeding device</u>		e.g. ATE Part No. 3.9302-1000.4 1)
<u>Bleeder fitting</u> To connect the charging and bleeding device at the equalizing reservoir of the master cylinder		ATE Part No. 3.9302.0702.2 1)
Bleeder hose		ATE Part No. 3.5909.2300.1 1)
Additional hose		ATE Part No. 3.9302.0704.2 1)
<u>Brake pedal actuator</u>		ATE Part No. 3.9312.0100.4 1)

1) Obtain from

Alfred Teves GmbH
 Guerickestraße 7
 6000 Frankfurt/Main

B23

Test equipment and tools
 BMW, 5 series



Name	Designation	Part No.
Pressure tester Tester for high and low pressure testing of hydraulic brake systems		e.g. ATE Part No. 3.9305-0200.4 1)
Double-head box wrench, open 9 x 11 mm		Hazet Part No. 612 2)
Pan To catch the brake fluid, approx. 1 l Brake fluid: BMW-DOT 4 or ATE SL-DOT 4 or Veedol Disc Brake Fluid DOT 4 or Castrol Disc Brake Fluid DOT 4		
Electric tester or multitester for trouble-shooting	ETE 014.00	0 684 101 400 commercially available

6.1 Aids

Use only original brake leads from BMW!

Name	Part No.
Grease for wheel speed sensors	Molykote Longterm 2
Protective cap for brake leads	1 900 508 002 (100 Pcs.)
Protective cap for brake lead con- nections on the hydraulic modulator	1 900 508 004 (100 Pcs.)

- 1) Obtain from: Alfred Teves GmbH,
Guerickestraße 7
6000 Frankfurt/Main
- 2) Firma Hazet, 5630 Remscheid



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1. SPECIAL FEATURES

This microcard contains the BMW models 535i, M535i, 635CSi, 735i for Europe and Sweden (S), Switzerland (CH), Australia (AUS). All models as of 10.84.

All models are equipped with the Bosch idle-speed control. The idle-speed control is controlled by the Motronic control unit. New functions which are controlled differently, depending on the version of vehicle:

- National variant: influence on lambda and spark-advance maps (except: idle and full-load characteristics) via term. 24 from control unit.
- Driving range switch: influence on idle speed control via term. 28 from control unit
- Linking with electronic transmission control which is supplied as an option in an independent control unit. In this case, full-load enrichment is triggered not by the throttle-valve switch, but through the transmission control unit. Likewise, the transmission control unit influences the spark-advance angle via term. 10 (map switch function). The spark-advance angle is influenced when shifting up and down in order to damp the jerk on shifting and thus to save clutch and transmission.

2. RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced Motronic expert to quickly check the electrical parts of the system with the universal test adapter.

If necessary, the similar microcard SIS-BMW 509 (525e) can be used as an aid.



Rapid diagnosis chart for universal test adapter

Test step	Switch position		Remarks	Test specifications (reading)
	V	Ω		
1	↓	1	Shift gear to neutral. Ignition off. Disconnect Motronic control unit and, if applicable, transmission control unit and pump relay. Control unit on 5 and 6 series in glove compartment; on 7 series in front-passenger footwell on right. Measure insulation resistance of engine-speed sensor term. 8 to term. 5.	greater than 1 M Ω
2	↓	2	Measure insulation resistance of reference-mark sensor term. 25 to term. 5	greater than 1 M Ω
3	↓	3	Measure winding resistance of engine-speed sensor term. 8 to term. 27.	0.6...1.6 k Ω
4	↓	4	Measure winding resistance of reference-mark sensor term. 25 to term. 26.	0.6...1.6 k Ω
5	↓	5	Measure resistance of engine temperature sensor (NTC II) term. 13 to term. 5.	at +15°C to +30°C: 1.45...3.3 k Ω (temperature-dependent)
6	↓	6	Measure resistance of air temperature sensor (NTC I) term. 22 to term. 5.	at +15°C to +30°C 1.45...3.3 k Ω (temperature-dependent)
7	↓	7	Measure resistance of map switch term. 10 to term. 5.	Manual transmission: less than 10 Ω Automatic: $\infty\Omega$ Electronic transmission control: see test step 18
8	↓	8	Not applicable	-----
9	↓	9	Accelerator in rest position Actuate accelerator (part-load range) Measure resistance of idle contact term. 2 to term. 5.	less than 10 Ω $\infty\Omega$

C3

Rapid diagnosis chart

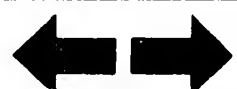
BMW 535i,M535i,635CSi,735i



C4

Rapid diagnosis chart

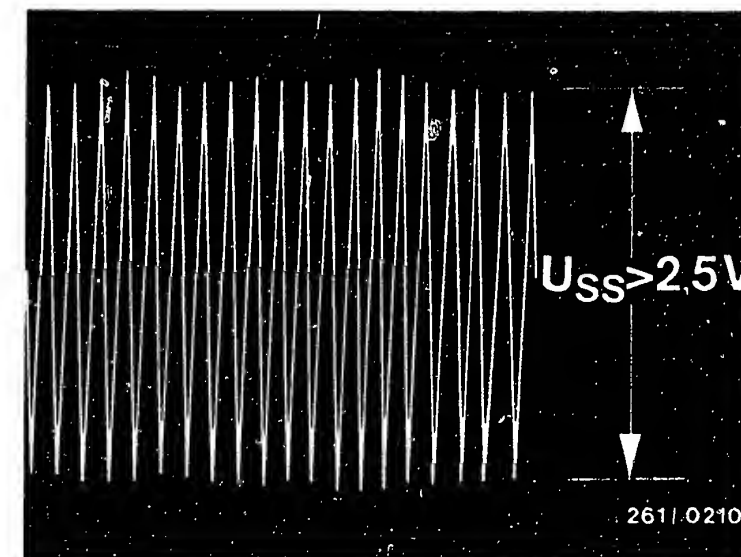
BMW 535i,M535i,635CSi,735i



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Remarks	Test specifications (reading)
	V	Ω		
10	↓	10	Fully depress accelerator. Measure resistance of full-load contact term. 3 to term. 5.	less than 10Ω
			Caution with electronic transmission control. No full-load contact, but full-load enrichment through transmission control unit (term. 31). Tested in test step 43.	
11	↓	11	Switch off ignition. Measure resistance. Ground term. 16 to term. 5.	less than 10Ω
12	↓	12	Measure resistance. Ground term. 17 to term. 5	less than 10Ω
13	↓	13	Measure resistance. Ground term. 19 to term. 5	less than 10Ω
14	↓	14	Not applicable	-----
15	↓	15	Measure resistance. Term. 28 to term. 5.	less than 10Ω
			Manual transmission: Automatic transmission and electronic transmission control: in positions P and N in positions 1, 2, 3 and D _____	less than 10Ω greater than $1\text{ M}\Omega$

16 1 15 Using oscilloscope, measure signal at engine-speed sensor term. 8 to term. 27. Shift gear to neutral and start. See diagram



Engine-speed sensor signal

C5

Rapid diagnosis chart

BMW 535i, M535i, 635CSi, 735i



C6

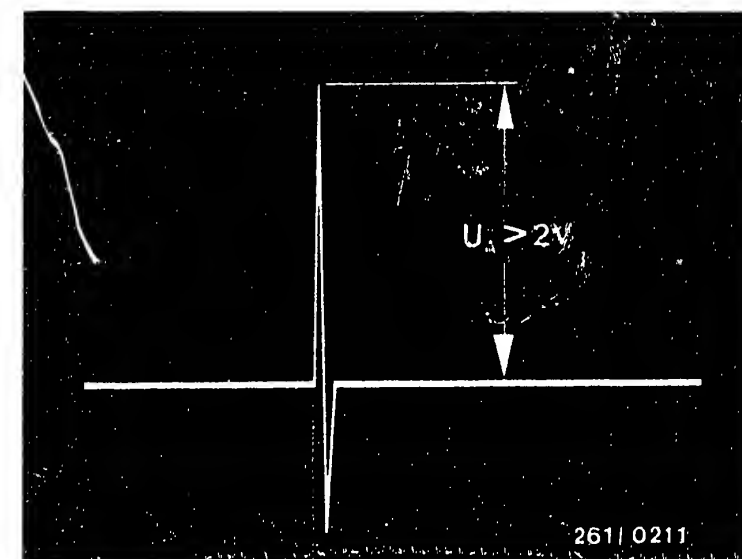
Rapid diagnosis chart

BMW 535i, M535i, 635CSi, 735i



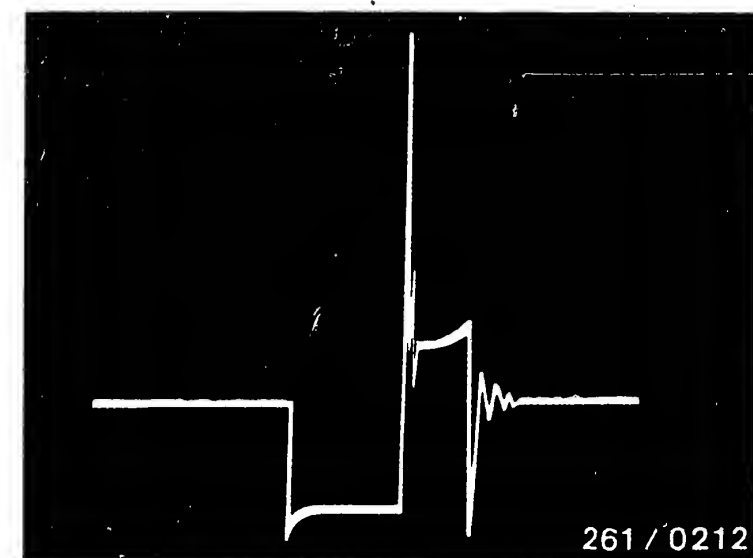
Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Remarks	Test specifications (reading)
	V	Ω		
17	2	15	Using oscilloscope, measure signal at reference-mark sensor term. 25 to term.26. Shift gear to neutral and start	See top diagram
18	3	15	Test applies only to vehicles with electronic transmission control. Switch off ignition and connect Motronic control unit. Ignition on. Measure voltage at term. 10 and term. 5.	greater than <u>3.5 V</u>
19	4	15	Switch on air conditioner. Measure voltage at term. 29 to term. 5.	greater than <u>8 V</u>
20	6	15	Measure voltage at relay 2 (main relay) term. 35 to term. 5.	<u>10...15 V</u>
21	7	15	Not applicable	-----
22	5	15	Measure ignition signal with oscilloscope. Shift gear to neutral and start. Control unit, ignition output stage term. 1 to term. 5.	See bottom diagram



Reference-mark sensor signal

Ignition signal



C7

Rapid diagnosis chart
BMW 535i,M535i,635CSi,735i



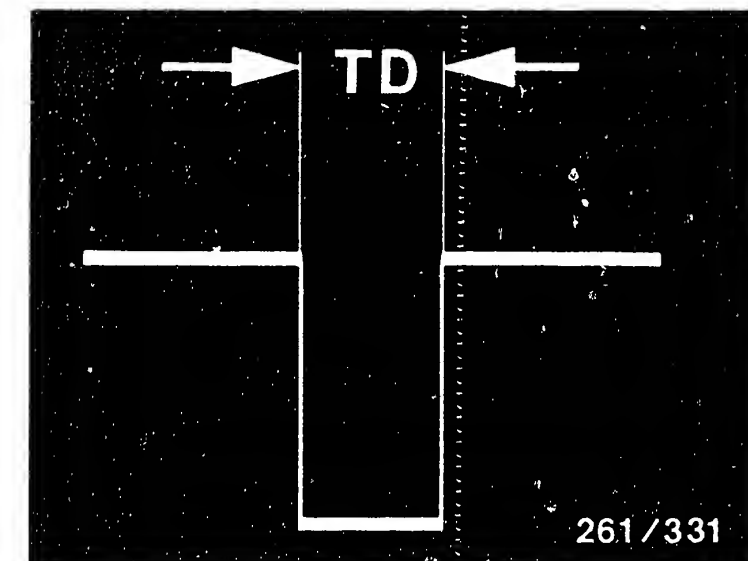
C8

Rapid diagnosis chart
BMW 535i,M535i,635CSi,735i



Rapid diagnosis chart for universal test adapter (continued)

<u>Test step</u>	<u>Switch position</u>		<u>But-ton</u>	<u>Remarks</u>	<u>Test specifications (reading)</u>
	V				
23	8	15		Measure voltage at control unit term. 9 to term. 5.	<u>greater than 4.5 V</u>
24	9	15		Measure voltage at air-flow sensor term. 7 to term. 5 Sensor flap in rest position:	<u>200...300 mV</u>
				Sensor flap fully open:	<u>greater than 4.2 V</u>
25/26	10/11	15		Not applicable	-----
27	12	15		Measure voltage. Starting signal term. 50. Shift gear to neutral and start. Term. 4 to term. 5.	<u>8...15 V</u>
28	13	15		Check dwell-period signal TD from control unit with oscilloscope. Term. 21 to term. 5. Shift gear to neutral and start.	<u>See diagram</u>

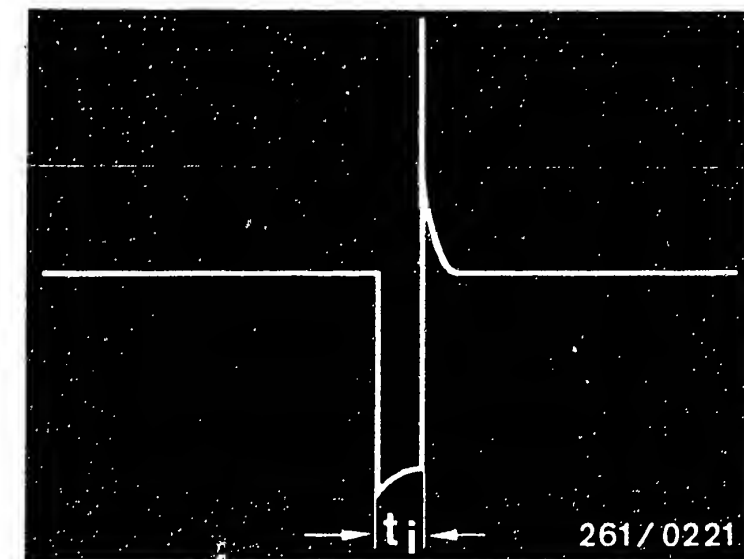


TD=Dwell-period signal



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test specifications (reading)
	V	Ω			
29	14	15		Check injection signal t_i from control unit with oscilloscope term. 14 to term. 5. Shift gear to neutral and start.	See top diagram
30	14	15	T1	As 29, but after pressing button (NTC II, cold) duration of injection becomes slightly longer. (Engine speed rises to above 1500 min^{-1})	
31	15	15		As test step 29, but check term. 15 to term. 5.	
32	16	15		Check duration of injection t_i from control unit with oscilloscope term. 11 to term. 5. Shift gear to neutral and start.	



Injection signal
 t_i = duration of injection

C11

Rapid diagnosis chart
 BMW 535i, M535i, 635CSi, 735i



C12

Rapid diagnosis chart
 BMW 535, M535i, 635CSi, 735i



Rapid diagnosis chart for universal test adapter (continued)

<u>Test step</u>	<u>Switch position</u>		<u>But-ton</u>	<u>Remarks</u>	<u>Test specifications (reading)</u>
	V	Ω			
33	17	15		Connect pump relay. Measure voltage at pump relay term. 20 to term. 5. Switch on ignition.	<u>10...15 V</u>
34	17	15		Measure voltage. Shift gear to neutral and start. Control unit, active pump control. Term. 20 to term. 5.	<u>max. 4 V</u>
35	17	15	T3	Ignition off. Connect pressure gauge. Switch on ignition. Press button T3. Read off fuel pressure.	<u>2.3...2.7 bar</u>
36	17	15		Connect motortester and diagnosis cable (1 684 463 095). Connect C0 analyzer. Let engine run. Check idle speed and C0.	<u>750...850 min⁻¹</u>
	17	15	T2	As above, readings unchanged.	<u>0.5...1.5 Vol.% CO</u> <u>S/CH/AUS:0.3...0.7Vol%C</u>
37	17	15		Let engine run. Check spark advance at idle speed. Important: ensure idle speed 750...850 min ⁻¹ , otherwise different spark-advance angles will be indicated.	<u>3°...13°</u> <u>S/CH/AUS: 5°...-5°</u>
	17	15	T6	Check spark-advance at full load. Set engine speed to 2000 min ⁻¹ and press T6 (full-load button). Caution with vehicles with electronic transmission control: before checking, be sure to disconnect transmission control unit (to do this, switch off ignition).	<u>20°...30° at engine speed 2000 min⁻¹</u>
38	17	15		Dwell angle at idle speed	<u>6°...18°</u>
				Dwell angle at 2700 min ⁻¹	<u>22°...42°</u>
39	17	15	T5	Keep engine speed constant at 2000 min ⁻¹ . Press button T5. Injection signals stop and start again at approx. 1200 min ⁻¹ .	<u>Engine "hunts"</u>

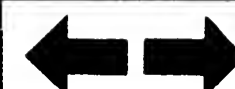
C13

Rapid diagnosis chart
BMW 535i,M535i,636CSi,735i



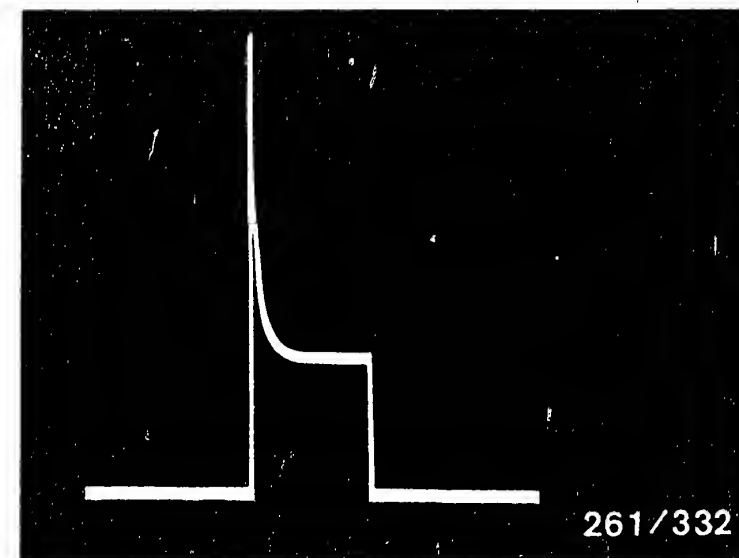
C14

Rapid diagnosis chart
BMW 535i,M535i,636CSi,735i



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test specifications (reading)
	V	Ω			
40	18	15	T5 and T6	Check on/off ratio of idle-speed control term. 33 to term. 5 with dwell-angle tester (% scale) and oscilloscope (special input). Clip term. 15 of motortester to red well. Disconnect transmission control unit. Press buttons T5 and T6 simultaneously. Read off test specifications. If necessary, correct idle speed at throttle-valve stop to 750...800 min ⁻¹ and re-adjust throttle-valve switch.	55%...65% (See top diagram for signal shape) S/CH/AUS: 51%...61%
41	19	15	T5 and T6	As test step 40, but term. 34 to term. 5.	35%...45% (See top diagram for signal shape) S/CH/AUS: 39%...49%
42	21	15		For Europe: term. 24 open	approx. 5 V
				For S/CH/AUS: term. 24 to ground through +45°C thermo-switch and speedometer. Test possible only on chassis dynamometer at speed greater than 65 km/h and with engine at operating temperature. Re-connect transmission control unit. To do this, switch off ignition.	0 V with ⌀ engine greater than 45°C and v greater than 65 km/h
43	↓	10		Test step applies only to vehicles with electronic transmission control. Caution: voltage measurement at ohm sockets. Switch over multimeter to voltage measurement. Connect transmission control unit. Disconnect pump relay. Selector switch in position P. Do not press accelerator.	1. After brief starting, do not switch off ignition: greater than 2 V 2. Fully depress accelerator: less than 1 V



Signal at idle actuator

C15

Rapid diagnosis chart
BMW 535i,M535i,635CSi,735i



C16

Rapid diagnosis chart
BMW 535i,M535i,635CSi,735i



3. TEST SPECIFICATIONS

● <u>Idle speed:</u>	<u>750...850 min⁻¹</u>
● <u>Exhaust-gas setting:</u> CO concentration with engine at normal operating temperature, all electrical devices off S/CH/AUS:	<u>0.5...1.5 Vol.%CO</u> <u>0.3...0.7 Vol.%CO</u>
● <u>Fuel pressure:</u>	<u>2.3...2.7 bar</u>
● <u>Fuel pump delivery:</u>	<u>min. 950 cm³/30 s</u>
● <u>Solenoid-operated injection valve</u> Electrical internal resistance at +20°C:	<u>15.0...17.5 Ω</u>
● <u>Air-flow sensor</u> Resistance between term. 7 and term. 6:	<u>8 Ω ... 2500 Ω</u> (Deflect sensor flap)
Term. 9 and term. 6:	<u>500 Ω ... 1100 Ω</u>
● <u>Idle actuator</u> Electrical internal resistance at +15°C to +30°C Term. 2 and term. 3 Term. 2 and term. 1	<u>17...22.5 Ω</u> <u>19...25 Ω</u>

See equipment and Autodata microcards for settings for valve clearance and other engine data.



Temperature sensor I (NTC I air):

Electrical internal resistance

at +15°C...+30°C:

1.45...3.3 kΩ

(measured at air-flow sensor
between term. 22 and term. 6)

at +80°C:

280...360 Ω

Temperature sensor II (NTC II, coolant):

Electrical internal resistance

at +15°C...+30°C:

1.3...3.6 kΩ

at +80°C:

250...390 Ω

Engine-speed sensor and reference-mark sensor

Electrical internal resistance

0.6...1.6 kΩ

Throttle-valve switch

Resistance of idle contact

(term. 2 and 18)

0 Ω

Full-load contact (term. 3 and 18):

0 Ω

Note: with electronic transmission control, no full-load contact, but full-load enrichment through transmission control unit (term. 31).

Idle contact through microswitch or throttle-valve sensor term. 4 and term. 6 (6-pin plug).

Start valve

Electrical internal resistance:

approx. 4 Ω

Thermo-time switch Electrical internal resistance:

35°C/8s

"G" and
ground

"W" and
ground

"G" and
"W"

Ambient temp.
(below +30°C):

25...40 Ω

0Ω

25...40 Ω

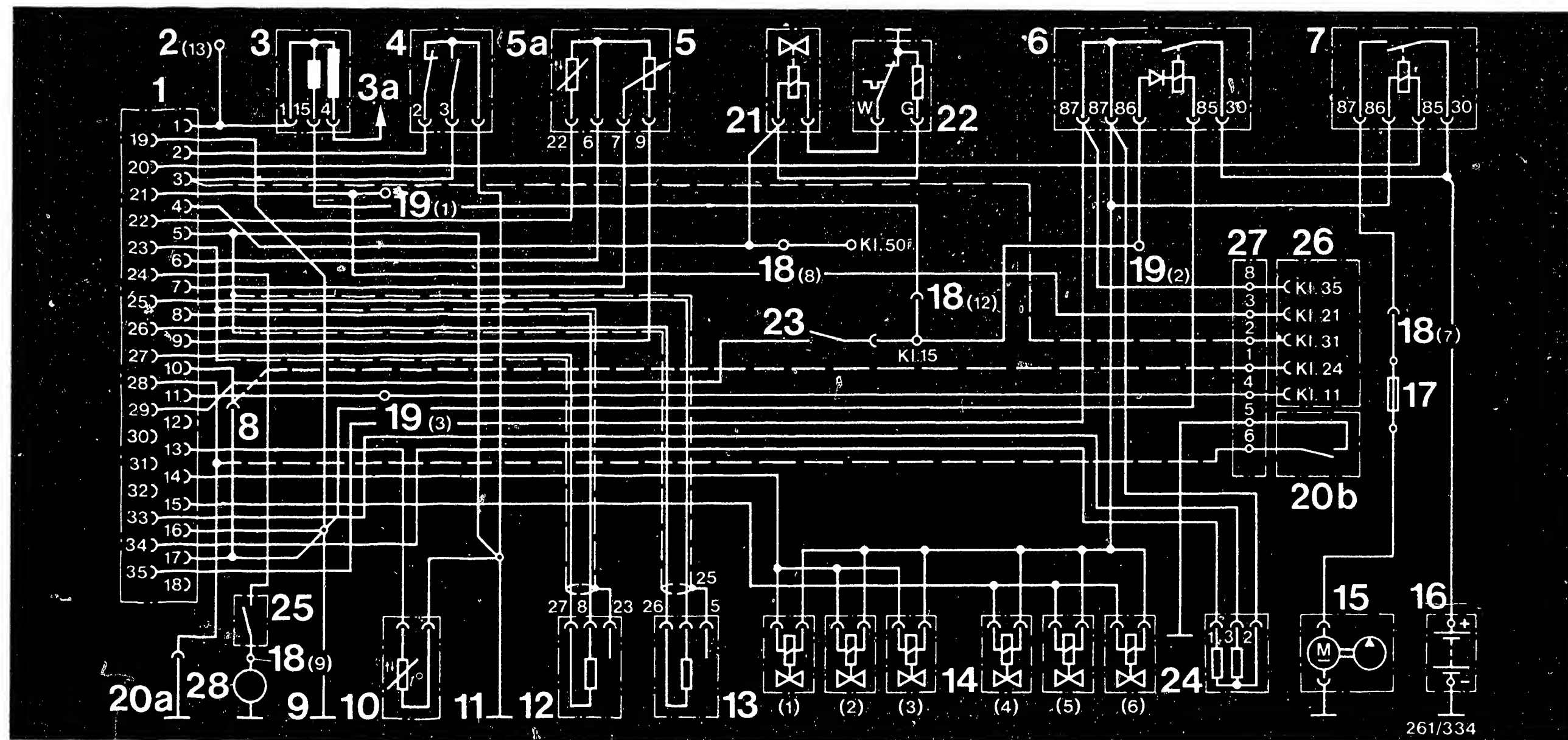
at op. temp.
(above +40°C)

50...80 Ω

100...160Ω

50...80 Ω





4. ELECTRICAL TERMINAL DIAGRAM

- | | | |
|---|--|--|
| 1 = Motronic control-unit plug | 5a = Temperature sensor I (air) | 9 = Vehicle ground for control unit output stage |
| 2 = Diagnosis plug (No. 13) | 6 = Relay 2 (main relay with incorrect-polarity protection diode) | 10 = Coolant temperature sensor |
| 3 = Ignition coil | 7 = Relay 1 (pump relay) | 11 = Vehicle ground for control unit |
| 3a = To high-voltage distributor | 8 = Plug connector connected for manual transmission (open for automatic transmission) | 12 = Engine-speed sensor |
| 4 = Throttle-valve switch (no full-load contact with electronic transmission control) | | 13 = Reference-mark sensor |
| 5 = Air-flow sensor | | 14 = Injection valves |

C19

Electrical terminal diagrams

BMW 535i, M535i, 635CSi, 735i



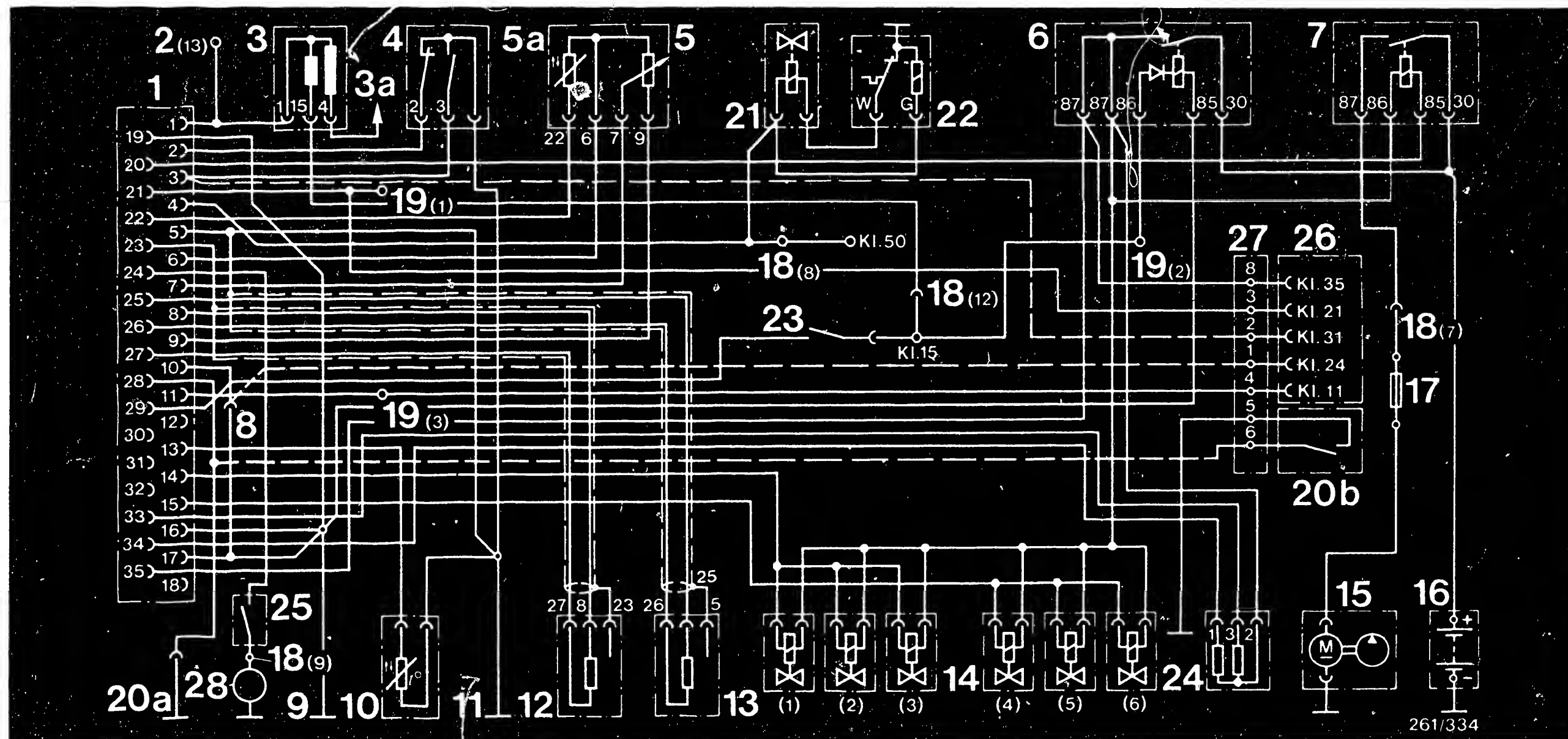
C20

Electrical terminal diagrams

BMW 535i, M535i, 635CSi, 735i



261/334



Electrical terminal diagram (continued)

- 15 = Fuel pump
- 16 = Battery
- 17 = Pump fuse F1
- 18 = Engine plug (No. 7,8,9,12)
- 19 = Plug connector (6-pin No. 1,2,3 in glove compartment)
- 20a = Automatic: plug connector open. Manual transmission: plug connector connected

- 20b = Automatic and electronic transmission control:
In positions P and N to ground
In positions D, 1,2 and 3 open.
- 21 = Start valve
- 22 = Thermo-time switch
- 23 = Air conditioner switch
- 24 = Idle actuator

- 25 = Thermo-switch +45°C only for S/CH/AUS. (For rest of Europe term. 24 not used)
- 26 = Electronic transmission control unit
- 27 = Plug connector (13 pin) in glove compartment
- 28 = Speedometer

C21

Electrical terminal diagrams

BMW 535i, M535i, 635CSi, 735i



C22

Electrical terminal diagrams

BMW 535i, M535i, 635CSi, 735i



5. IMPORTANT GENERAL INFORMATION

Be sure to follow these instructions in order to prevent damage to engine, control unit and ignition coil and to prevent risk to persons.

5.1 Never start engine without securely connected battery.

5.2 Incorrect polarity of supply voltage, e.g. through incorrect connection of battery or ignition coil, may lead to destruction of control unit.

5.3 Do not use a fast charger for starting the engine.

For starting assistance, use only second 12 V battery and jump leads.

Caution: Due to non-standardized requirements of vehicle manufacturers as regards electronic products, we advise you not to use a 24 V battery for starting assistance. Follow owner's manual of vehicle.

5.4 Disconnect battery from vehicle electrical system before fast charging.

5.5 If charging the battery in the vehicle or if rendering starting assistance, follow the instructions in the operating instructions for the fast charger as well as the instructions of the vehicle manufacturer.

5.6 Never disconnect the battery from the vehicle electrical system with the engine running.



5.7 Do not short-circuit ignition coil term. 1 to ground (e.g. for stopping the engine). Ignition coil and, possibly, control unit will be destroyed.

5.8 Never connect positive pole of battery to ignition coil term. 1. Control unit will be destroyed.

5.9 Never disconnect or connect wiring-harness plug of control unit with ignition on.

5.10 Remove the control unit at temperatures above +80°C (paint-drying installation).

5.11 Remove the control unit before carrying out welding work (electric spot welding).

5.12 When testing compression, disconnect the main relay. This prevents undesired injecting through the injection valves.

5.13 If an alarm system is installed, follow the information in installation instructions for Motronic vehicles or SIS microcard ALL-500.

It must be ensured that the alarm relay is not disturbed by extraneous fields (e.g. by ignition cables), causing it to trip incorrectly.

5.14

Caution!

High-energy ignition system; dangerous voltages on primary and secondary sides.

Contact with live parts or terminals may be extremely dangerous (both on the primary as well as on the secondary sides).

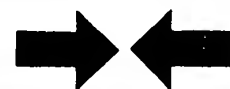


T A B L E O F C O N T E N T S

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Electrical wiring diagram.....	D 11
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Emission control.....	D 14
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SPECIAL FEATURES

- * Engine-speed limitation in control unit at 6400 min⁻¹
- * O-ring sealing technique on solenoid-operated injection valves and on pressure regulator.

Special features (Sweden/Switzerland/Australia versions)

2.8 l engine only:

- * 5 and 7 series only
- * secondary-air induction
- * additionally exhaust-gas recirculation on vehicles with automatic transmissions

Note:

The LE 1.1 Jetronic in the BMW 2.5/2.8 l engine as of 9.84 corresponds basically to the previous vehicles. Similar SIS repair instructions: SIS microcard BMW 00/J21.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER


The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system with the universal test adapter.

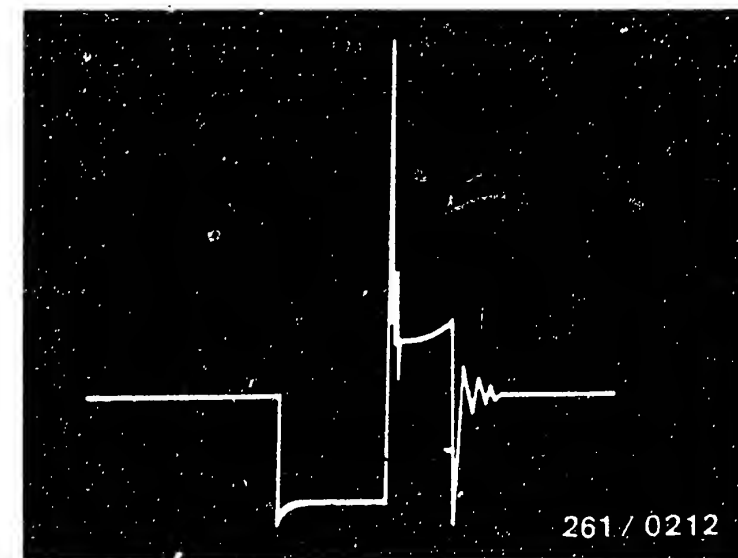
The rapid diagnosis chart contains the following information

- Switch positions on universal test adapter
- Sequence of test steps
- Notes on how to operate the universal test adapter or other components
- Readings on multimeter



Rapid diagnosis chart for universal test adapter

Test step	Switch position		Remarks	Test specifications (Reading)
	V	Ω		
1	5	-	Shift gear to neutral and start. Term. 1 signal on ignition trigger box term. no. 16. On control unit plug term. 1 to term. 5	see top diagram
2	6	-	Shift gear to neutral and start. Voltage from control relay term. 87 on control unit plug term. 9 to term. 5	<u>8 ... 15 V</u>
3	7	-	Shift gear to neutral and start. Voltage from starting motor term. 50 on control unit plug term. 4 to term. 5	<u>8 ... 15 V</u>
4		11	Resistance combination in air-flow sensor on control unit plug term. 8 to term. 5	100 ... 200 Ω



Primary signal

D3

Rapid diagnosis chart
BMW











D4

Rapid diagnosis chart
BMW



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Measurement	Remarks	Test specifications (Reading)
	V	Ω			
5		12	Resistance of air-flow sensor potentiometer on control unit plug term. 7 to term. 5	Deflect sensor flap as far as it will go	<u>60 ... 1000 Ω</u>
6		13	Resistance of temperature sensor NTC II (engine temperature) on control unit plug term. 10 to term. 5	---	(+15°C...+30°C): <u>1.3...3.6 kΩ</u> +80°C: <u>250...390 Ω</u>
7		14	Resistance of output stage ground on control unit plug term. 13 to term. 5		<u>0 ... 10 Ω</u>
8		15	Resistance of output stage ground on control unit plug term. 25 to term. 5	---	<u>0 ... 10 Ω</u>
9		16	Resistance of idle contact in throttle-valve switch, on control unit plug term. 2 to term. 9	Accelerator in rest position	<u>0 ... 10 Ω</u>
10		17	Resistance of full-load contact in throttle-valve switch on control unit plug term. 3 to term. 9	Accelerator in full-load position	<u>0 ... 10 Ω</u>
11		18	Resistance of 4th, 5th and 6th parallel-connected solenoid-operated injection valves on control unit plug term. 12 to term. 9	---	(+15°C ... +30°C): 0 280 150 714 <u>8.00 ... 10.70 Ω</u>
12		19	Resistance of 1st, 2nd and 3rd parallel-connected solenoid-operated injection valves on control unit plug term. 24 to term. 9	---	+ 80°C: 0 280 150 714 <u>8.5 ... 11.5 Ω</u>

D5

Rapid diagnosis chart

BMW



D6

Rapid diagnosis chart

BMW



TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure 2.8 ... 3.2 bar

Electric fuel pump

- 2.5 l engine delivery
(measured in return): min. 850 cm³/30 s
- 2.8 l engine delivery
(measured in return): min. 875 cm³/30 s
- Terminal voltage
(under load): min. 12 V

Thermo-time switch (35°/8s):

● Electrical internal resistance at	Between term. "G" + ground	Between term. "W" + ground	Between term. "G" + "W"
Ambient temperature (below +30°C)	25...40Ω	0 Ω	25...40 Ω
engine at op. temp. (above +40°C)	50...80Ω	100...160Ω	50...80 Ω

Start valve

- electrical internal resistance 3.5...4.5 Ω
- Leaks: max. allowable 1 drop/min.

Auxiliary-air device

- electrical internal resistance: 35...70 Ω

Temperature sensor II (engine)

- electrical internal resistance
at ambient temperature (+15°...+30°C): 1.3...3.6 kΩ
engine at op. temp. (approx. +80°C): 250...390 Ω

Solenoid-operated injection valve (at +20°C)

- electrical internal resistance
(0 280 150 714): 14.5...17.0 Ω



Air-flow sensor

- Resistance between
 - term. 8 and term. 5: 340...450 Ω
 - term. 7 and term. 5 (sensor flap fully deflected) 60...1000 Ω
 - term. 9 and term. 5: 500...760 Ω
 - term. 8 and term. 9: 160...300 Ω

Idle adjustment (engine at normal operating temperature, approx. +80°C)

manual and automatic transmission: 800...900 min⁻¹

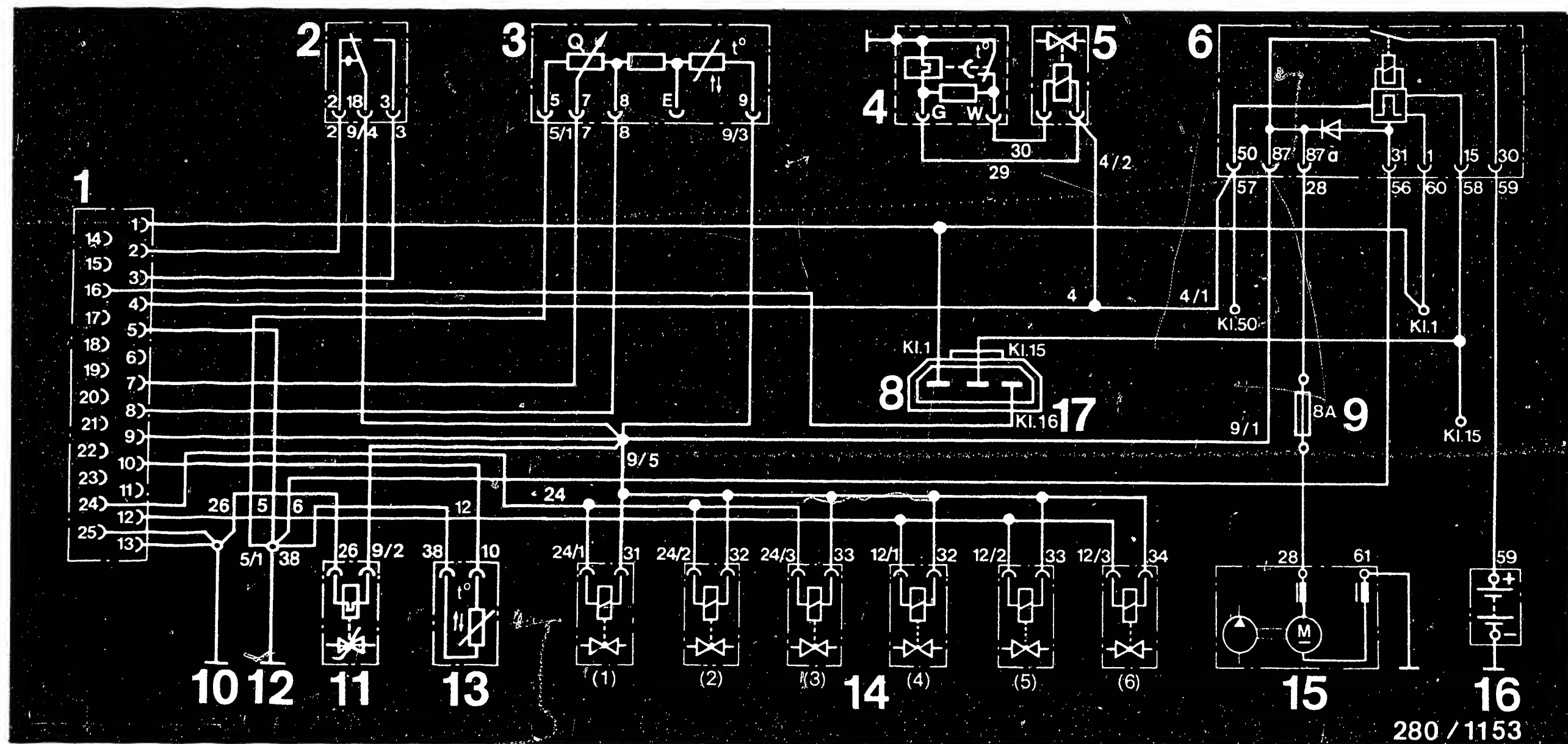
CO adjustment

1.0...1.5 vol.%CO

Switch off exhaust-emissions system for duration of measurement and adjustment of exhaust gas. Observe accident-prevention regulations.

See equipment and Autodata microcards for settings for ignition, valve clearance and other engine data.





ELECTRICAL TERMINAL DIAGRAM

BMW 2.5 1 / 2.8 1 as of 9.84 Europe

- | | | | |
|---------------------------|---|-----------------------------------|---|
| 1 = Control unit plug | 5 = Start valve | 9 = Pump fuse | 13 = Temperature sensor |
| 2 = Throttle-valve switch | 6 = Control relay | 10 = Output stage ground terminal | 14 = Injection valves |
| 3 = Air-flow sensor | 8 = Connection of vehicle wiring harness (near glove compartment) | 11 = Auxiliary-air device | 15 = Electric fuel pump |
| 4 = Thermo-time switch | | 12 = Electronics ground terminal | 16 = Battery |
| | | | 17 = Term. 16 measuring output of trip computer |

D9

Electrical terminal diagram

BMW

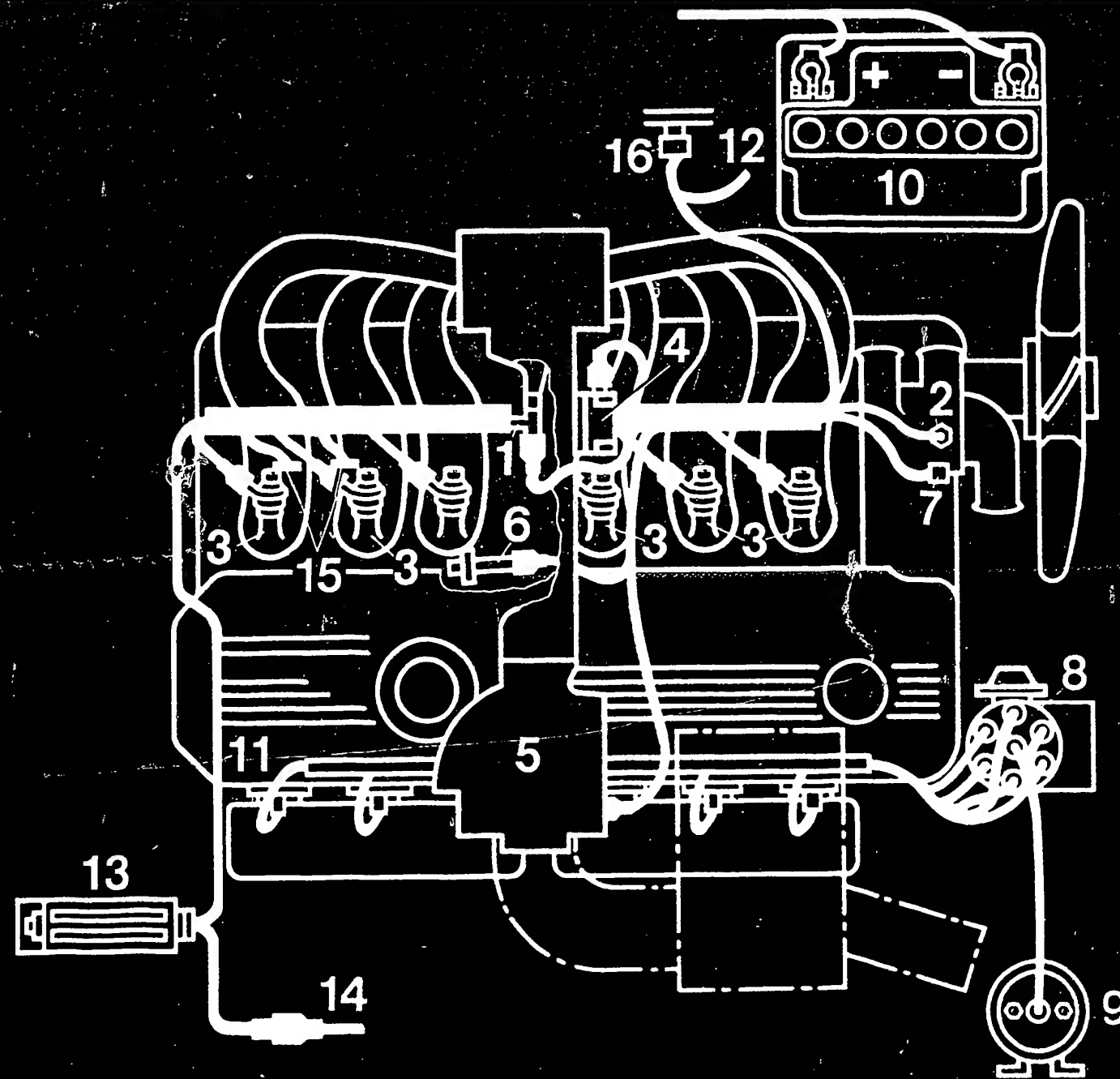


D10

Electrical terminal diagram

BMW





280/0365

Electrical wiring diagram of LE-Jetronic and arrangement of individual components

- | | | | |
|---------------------------|---------------------------|------------------------------|------------------------------|
| 1 = Start valve | 5 = Air-flow sensor | 9 = Ignition coil | 13 = Control unit |
| 2 = Thermo-time switch | 6 = Auxiliary-air device | 10 = Battery | 14 = Plug connection term. 1 |
| 3 = Injection valve | 7 = Temperature sensor II | 11 = Jetronic wiring harness | 15 = Ground terminals |
| 4 = Throttle-valve switch | 8 = Ignition distributor | 12 = Vehicle wiring harness | 16 = Control relay |

D11

Electrical wiring diagram
BMW



D12

Electrical wiring diagram
BMW



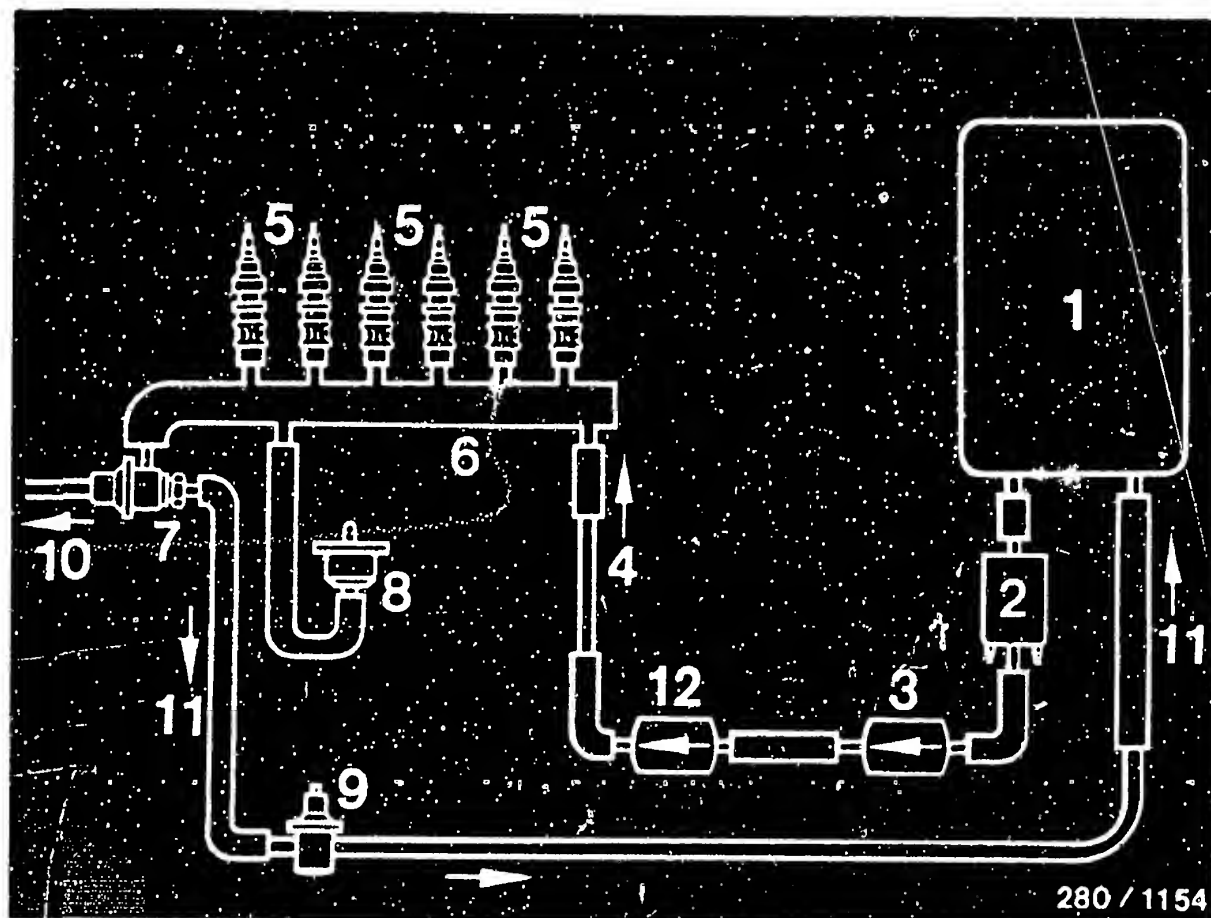
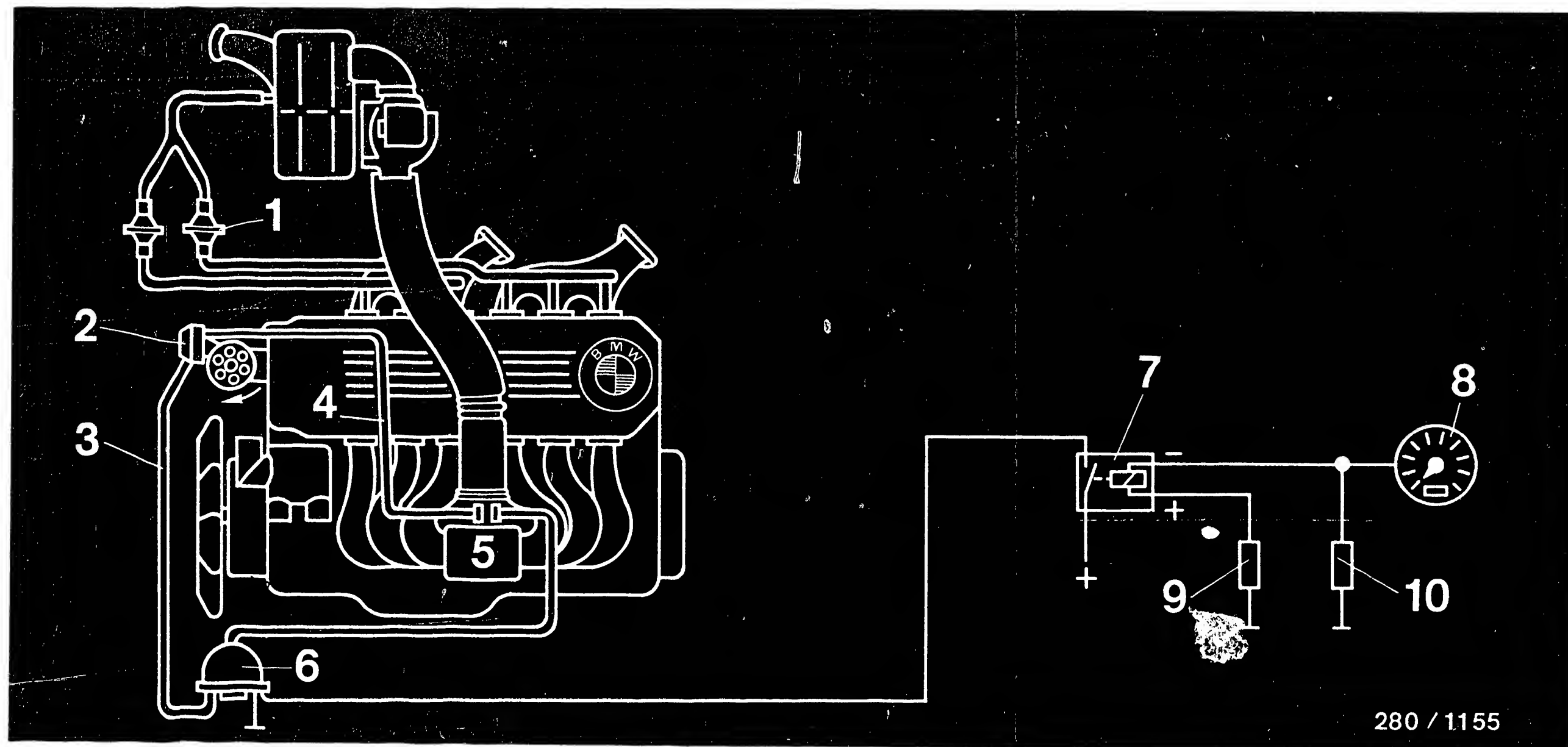


Diagram of fuel lines

- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel filter
- 4 = Fuel delivery line
- 5 = Solenoid-operated injection valves
- 6 = Fuel-distribution pipe
- 7 = Pressure regulator
- 8 = Start valve
- 9 = Fuel-line-pressure damper
- 10 = Connection to intake manifold
- 11 = Fuel return line
- 12 = Fuel spinner (7 series)
can be dropped for 5 and 6 series



Emission control (secondary-air induction) 528i AUS- + CH- + S version, 728i CH + S version, all as of 1984 model

- 1 = Self-aspirating air valves
 - 2 = Ignition distributor (vacuum unit)
 - 3 = Advance vacuum (black)
 - 4 = Retard vacuum (white)
 - 5 = Intake manifold
 - 6 = Change-over valve (black)
- Throughflow when change-over relay actuated

- 7 = Electric change-over relay activates advance:
at coolant temperature greater than
+55°C + speed greater than
65 km/h or 4th/5th gear
- 8 = Speedometer
- 9 = Thermo-switch + 55°C
- 10 = 4th/5th gear switch

D14

Emission control (secondary-air induction)
BMW

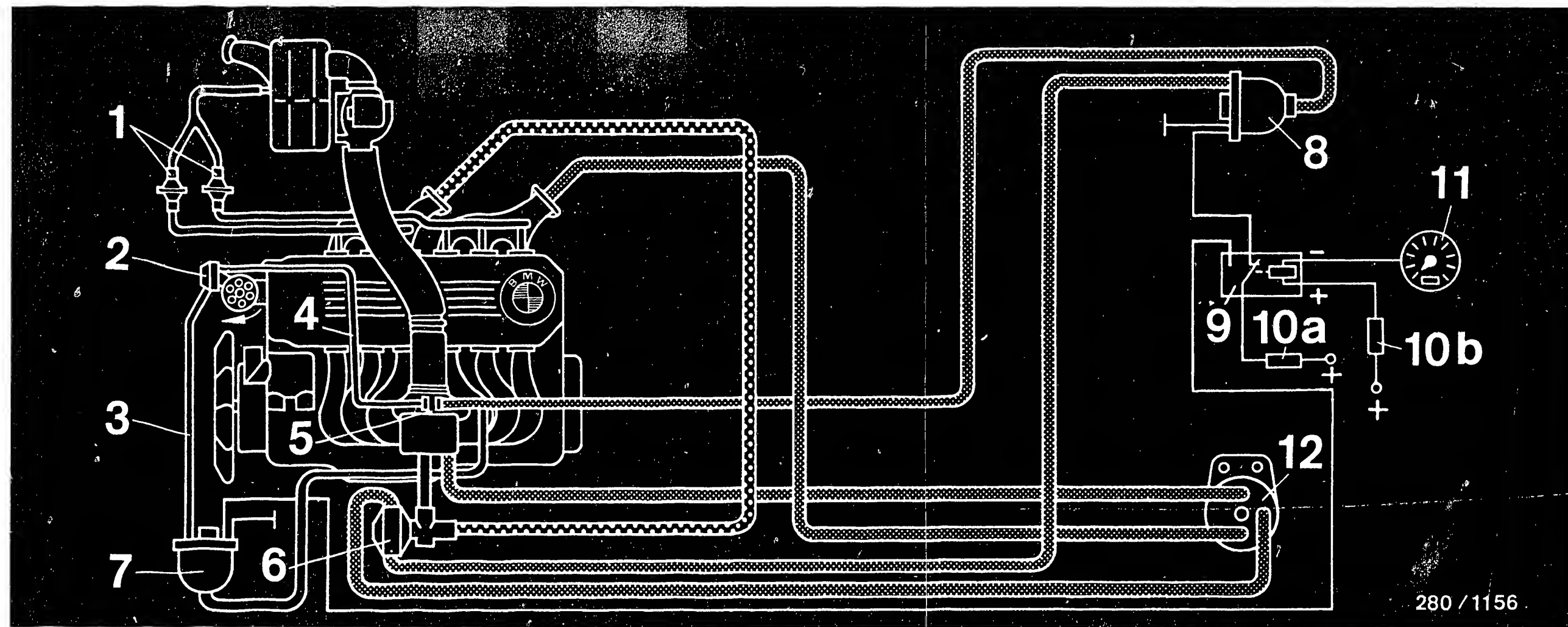


D15

Emission control (secondary-air induction)
BMW



280 / 1155



280 / 1156

Emission control (secondary-air induction and exhaust-gas recirculation) 528i AUS- + CH- + S version, all automatic-transmission vehicles as of 1984 model

- 1 = Self-aspirating air valves
- 2 = Ignition distributor (vacuum unit)
- 3 = Advance vacuum (black)
- 4 = Retard vacuum (white)
- 5 = Intake manifold
- 6 = EGR valve
- 7 = Electric change-over valve (black)
Throughflow when electric change-over relay actuated, and at coolant temperature greater than +45°C
- 8 = Electric change-over valve for exhaust-gas recirculation (red)

- 9 = Electric change-over relay activates advance:
at coolant temperature greater than +55°C and speed greater than 65 km/h
Shutdown of exhaust-gas recirculation:
Speed below 65 km/h or coolant temperature below +55°C
- 10a = Thermo-switch +45°C
- 10b = Thermo-switch +55°C
- 11 = Speedometer
- 12 = Pressure converter

D 16

Emission control
BMW



D 17

Emission control
BMW



Emission control

1. Secondary-air induction

- Operating principle:

Through the supply of fresh air into the exhaust manifold, the exhaust gases are afterburnt, thereby reducing the CO/HC values.

The fresh air is drawn in from the air filter through the self-aspirating air valves by vacuum which is generated by pressure pulses in the exhaust manifold.

- Checking the self-aspirating valves:

- Check CO concentration.
- CO concentration must be lower with hose connected (hose between the valves and the air filter) to air filter than when hose is disconnected and sealed.
- Check self-aspirating valves for leaks by blowing in.

Toward exhaust - throughflow

In opposite direction - no throughflow

2. Electric change-over relay for vacuum advance and exhaust-gas recirculation (red)

- Operating principle:

With the ignition on and at a coolant temperature greater than +45°C or with +45°C switch jumped, there is voltage across electric change-over valve (red) with 4th/5th gear selected and +55°C switch jumped at electric change-over valve (black).



3. Vacuum advance

- Operating principle

At a coolant temperature greater than +55°C and a speed greater than 65 km/h or with 4th/5th gear selected (manual transmission only) the vacuum advance is activated via the electric change-over relay.

- Check

- engine at normal operating temperature
- +45°C / +55°C switch switched or jumped
- Ignition "ON"
- Disconnect plug from electric change-over valve (black) and measure voltage at lead.
- 4th/5th gear switch O.K. if there is voltage when 4th/5th gear selected.
- No voltage, check switch/relay for this (on fuse box at front right)
- Important: Due to poor heat transfer between rubber hose and +55°C switch, the switch switches when installed only at approx. +75°C water temperature.

4. Speedometer

- Check

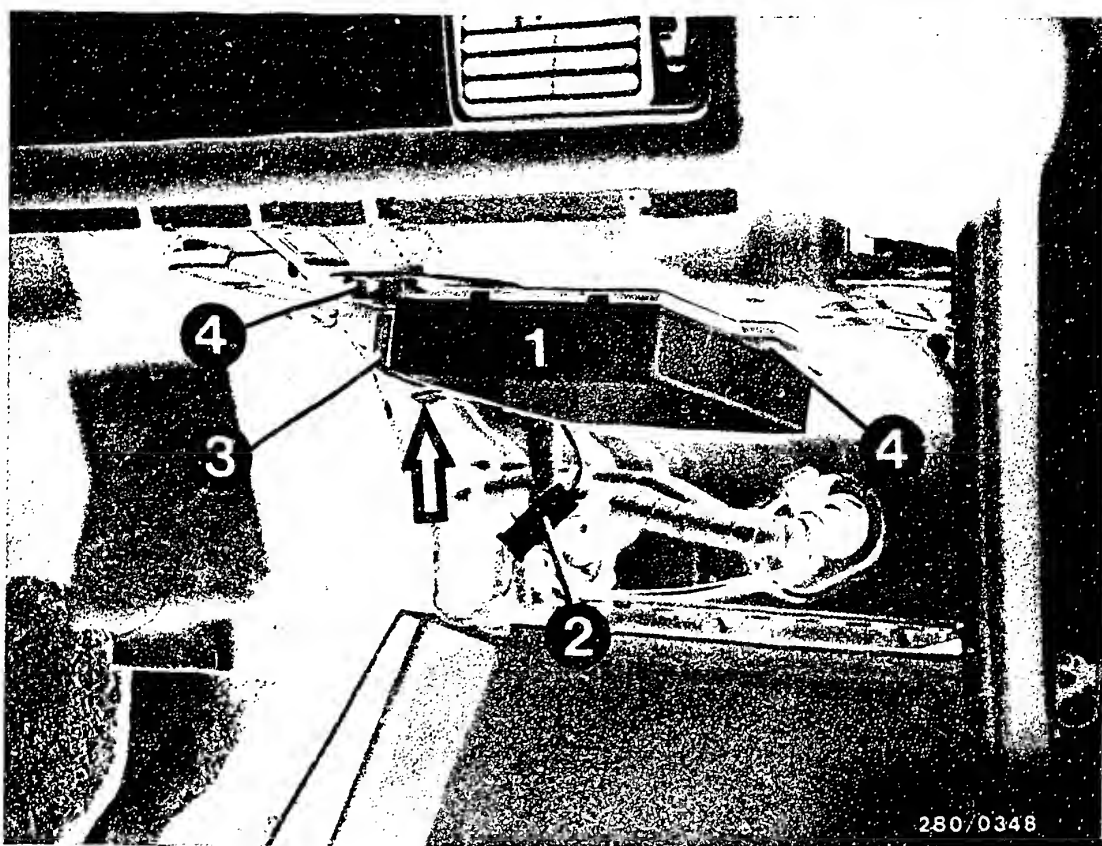
- Simulate driving speed
- Jump +55°C switch - electric change-over relay must switch from the red to the black electric change-over valve above a speed of 65 km/h

5. Electric change-over valve (black)

- Check

- Ignition "ON"
- Disconnect hose (at bottom on valve)
- Disconnect hose (at top on T-piece) and blow in.
- The electric change-over valve is O.K. if there is air throughflow with 4th/5th gear selected or at a simulated speed of greater than 65 km/h.





- 1 = Control unit
- 2 = Plug-in connection term. 1 (lead no. 1)
- 3 = to connect universal test adapter, disconnect control unit plug (25-pin). To do this, press detent in direction of arrow.
- 4 = Fastening screws

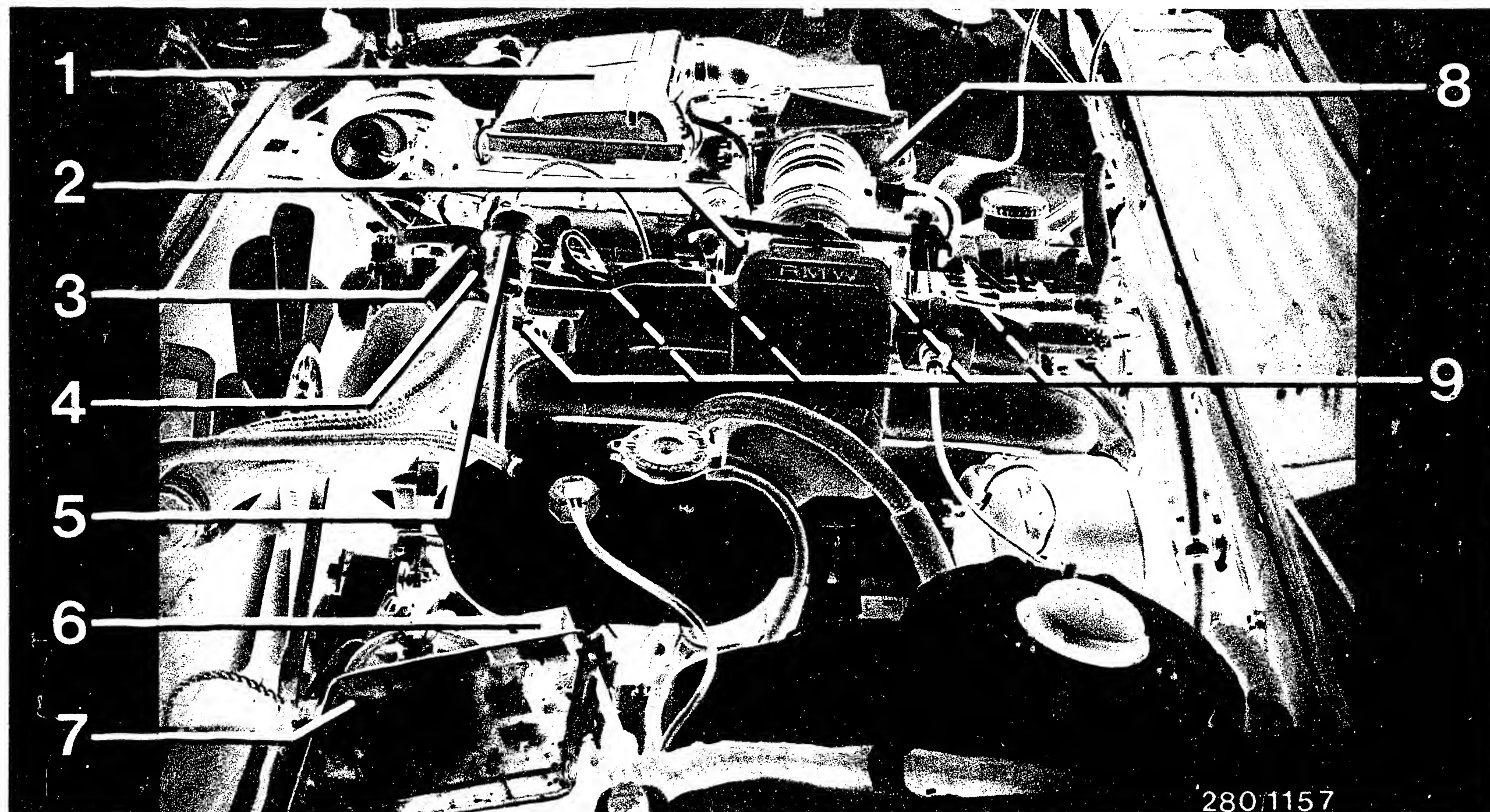
Installation position of remaining components

The indications "left" and "right" apply always as viewed in the forward direction of travel

Control unit

The control unit is in the passenger compartment, front passenger side, in the glove compartment behind a cover.





Installation position of components - EU models

1 = Air filter
 2 = Throttle-valve switch
 3 = Temperature sensor II (white plug)

4 = Thermo-time switch
 5 = Pressure regulator
 6 = Control relay

7 = Pump fuse
 8 = Air-flow sensor
 9 = Injection valves

D22

Installation position of components

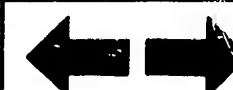
BMW



D23

Installation position of components

BMW



<u>Electric fuel pump:</u>	Under vehicle, on right near rear axle.
<u>Start valve:</u>	On intake manifold, under throttle-valve assembly.
<u>Fuel filter:</u>	Under vehicle, on right near rear axle.
<u>Ground connection of electric fuel pump:</u>	Under vehicle on right, near electric fuel pump on rear axle support.
<u>Electronics ground terminal</u> <u>Output stage ground terminal:</u>	In engine compartment between 5th and 6th solenoid-operated injection valves
<u>Fuel-line-pressure damper:</u>	In engine compartment on left under mounting of cooling water expansion tank (near fuse box).
<u>Auxiliary-air device:</u>	On cylinder head, under throttle-valve assembly.



T A B L E O F C O N T E N T S

Section

Coordinates

Special Features	E 2
Rapid Diagnosis Chart	E 3
Test Specifications	E 8
Electrical Terminal Diagram	E 10
Electrical Wiring Diagram	E 12
Fuel Line Diagram	E 14
Secondary Air Induction / Timing Advance	E 15
Checking Fuel Pressure	E 17
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Special Features:

This microcard contains the LE-Jetronic trouble-shooting instructions for the following BMW models valid at the time of printing:

- 318i/518i Europe version (from 9.84) LE 1.1 version
- 318i/518i Sweden/Switzerland/Australia version (from 9.84) LE 1.1 version.

Special Features (all vehicles):

- 0-ring connection for solenoid-operated injection valves and pressure regulator
- Fuel filter located in engine compartment
- Control unit 0 280 000 330
- Engine compression 9.5:1
- Control unit with engine-speed limiting (at 6400 min⁻¹)
- t_p -dependent enrichment
- t_i -output term. 16 for on-board computer

Special Features (Sweden/Switzerland version):

- Secondary-air induction
- Vacuum timing advance

Remark

Basic microcard for detailed trouble-shooting: BMW 505

Important: when referring to a basic microcard it should be noted that the test specifications must always be taken from the vehicle-specific brief instructions.



RAPID DIAGNOSTIC CHART FOR UNIVERSAL TEST ADAPTER

The rapid diagnostic chart below makes it possible for the experienced L-Jetronic expert to check the electrical portion of the system quickly using the universal test adapter.

The rapid diagnostic chart includes the following information:

- Switch settings on the universal test adapter
- Sequence of test steps
- Notes on operation of the universal test adapter or other components
- Reading on the multimeter

E3

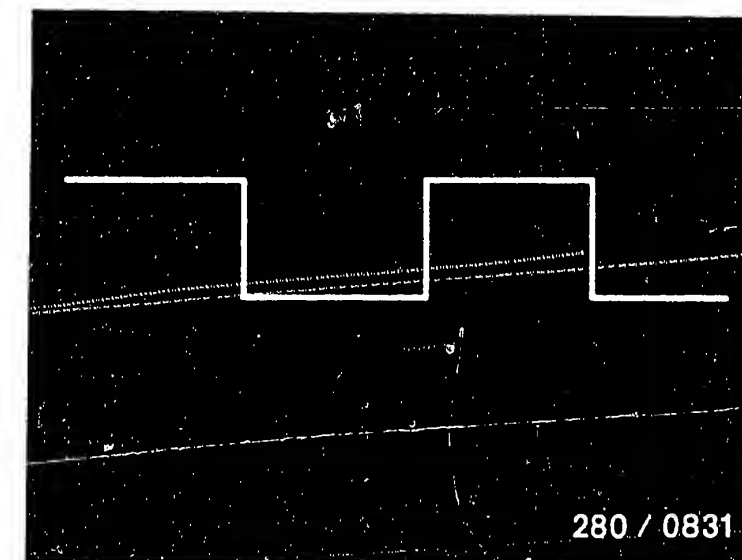
Rapid diag. chart for univ. test adapt.

BMW



Rapid Diagnosis Chart for Universal Test Adapter

Test Step	Switch Position		Remarks	Test Specifications (Reading)
	V	Ω		
1	5	-	Shift gear to neutral and start. t_D -signal at ignition trigger box term. no. 4. At control unit plug term. 1 to term. 5.	See illustration
2	6	-	Shift gear to neutral and start. Voltage from control relay term. 87 at control unit plug term. 9 to term. 5	<u>8 ... 15 V</u>
3	7	-	Shift gear to neutral and start. Voltage from starting motor term. 50 at control unit plug term. 4 to term. 5	<u>8 ... 15 V</u>
4	↓	11	Resistor combination in air-flow sensor. At control unit plug term. 8 to term. 5	100 ... 200 Ω



t_D -signal

E4

Rapid diag. chart for univ. test adapt.

BMW



E5

Rapid diag. chart for univ. test adapt.

BMW



Rapid diagnostic chart for the universal test adapter (continued)

Test step	Switch setting		Measurement	Notes	Test specification (Reading)
	V	Ω			
5	↓	12	Resistance of the air-flow sensor potentiometer on the control unit plug Term.7 to Term. 5	Deflect air-flow sensor flap as far as the stop	<u>60 ... 1000 Ω</u>
6	↓	13	Resistance of the temperature sensor NTC II (engine temperature) on the control unit plug Term. 10 to Term. 5	---	(+15°C...+30°C): <u>1.3...3.6 kΩ</u> +80°C: <u>250...390 Ω</u>
7	↓	14	Resistance ground-output stage on the control unit plug Term. 13 to Term. 5	---	<u>0 ... 10 Ω</u>
8	↓	16	Resistance of the idle contact in the throttle valve switch, on control unit plug Term. 2 to Term. 9	Accelerator pedal in at rest position	<u>0 ... 10 Ω</u>
9	↓	17	Resistance of the full-load contact in the throttle valve switch, on the control unit plug Term. 3 to Term. 9	Step all the way down on the accelerator pedal (full-load setting)	<u>0 ... 10 Ω</u>
10	↓	18	Resistance of all 4 electric fuel-injection valves connected in parallel, on the control unit plug Term. 12 to Term. 9	---	(+15°C...+30°C): <u>6,8...9,3 Ω</u> +80°C: <u>7,0...9,8 Ω</u>

E6

Rapid diag. chart of univ. test adapt.
BMW



E7

Rapid diag. chart of univ. test adapt.
BMW



TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure EU/S/SWITZ./AUSTR. version 2.3...2.7 bar

Electric fuel pump

- Fuel delivery (measured in the return): min. 650 cm³/30 s
- Voltage at connection (under load): min. 12 V

Thermotime switch (35°/8s):

• Internal electrical resistance at	Between Term. "G" and ground	Between Term. "W" and ground	Between "G" and "W"
Ambient temperature (less than +30°C)	25...40 Ω	0 Ω	25...40 Ω
engine at normal operating temperature (above +40°C)	50...80 Ω	100...160 Ω	50...80 Ω

Electric starting valve

- internal electrical resistance: 3.5...4.5 Ω
- leakage: max. allowable 1 drop/min.

Temperature sensor II (engine)

- internal electrical resistance at ambient temperature (+15°...+30°C): 1.3...3.6 kΩ
- engine at normal operating temperature (approx. +80°C): 250...390 Ω

Electric fuel-injection valve (at +20°C)

- internal electrical resistance 14.5...17.0 Ω

Auxiliary-air device

- internal electrical resistance: 30...65 Ω



Air-flow sensor

- Resistance between

Term. 8 and Term. 5:	340...450 Ω
Term. 7 and Term. 5 (deflect air-flow flap all the way)	60...1000 Ω
Term. 9 and Term. 5:	500...760 Ω
Term. 8 and Term. 9:	160...300 Ω

Idle adjustment (engine at normal operating temperature, approx. +80°C)

Manual and automatic transmissions: 800...900 min⁻¹

CO-adjustment

- Model for Europe less than 1.0 vol. % CO
- Model for S/SWITZ./AUSTR., test specification (with exhaust gas recirculation connected): 0.2...0.4 vol%CO
- Setting (hose disconnected and plugged): 0.3...1.0 vol%CO

Switch the exhaust gas recirculation system off for the duration of the exhaust gas measurement and adjustment.

For settings for ignition, valve clearance, and other engine data, see the Equipment a.Auto Data Microfiche.



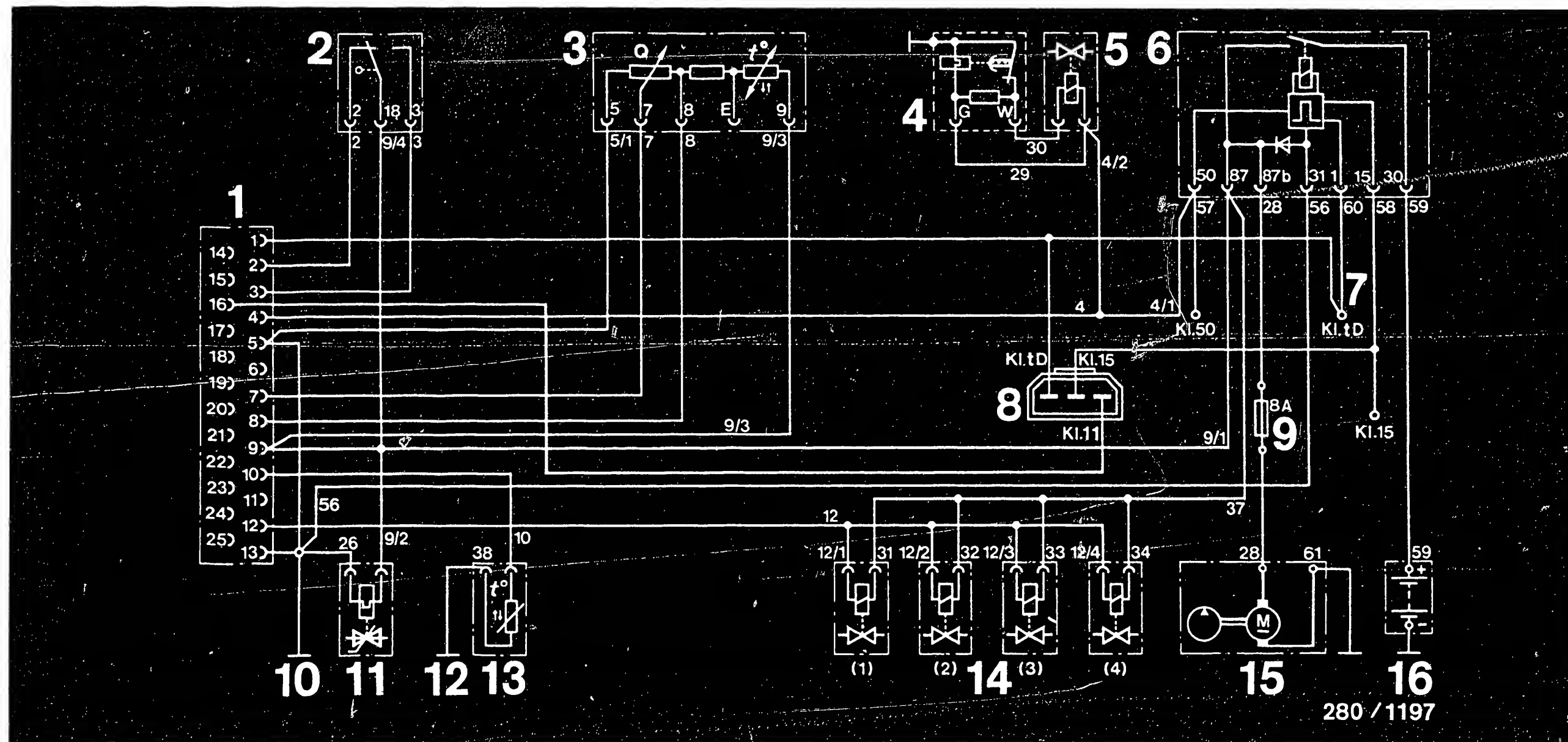


DIAGRAM OF ELECTRICAL CONNECTIONS from 9.84

BMW Europe/Sweden/Switzerland/Australia

- | | | | |
|---------------------------|--|---|--------------------------------|
| 1 = Control unit plug | 5 = Electric starting valve | 9 = Pump fuse | 13 = Temperature sensor II |
| 2 = Throttle valve switch | 6 = Control relay | 10 = Ground terminal, output stage | 14 = Electric fuel-inj. valves |
| 3 = Air-flow sensor | 7 = To ignition trigger box term. 4 | 11 = Auxiliary-air device | 15 = Electric fuel pump |
| 4 = Thermotime switch | 8 = Connection for fuel-inj. and on-board computer | 12 = Ground terminal, electronic system | 16 = Battery |
| | | | Kl. = Term. |

E10

Electrical terminal diagram

BMW



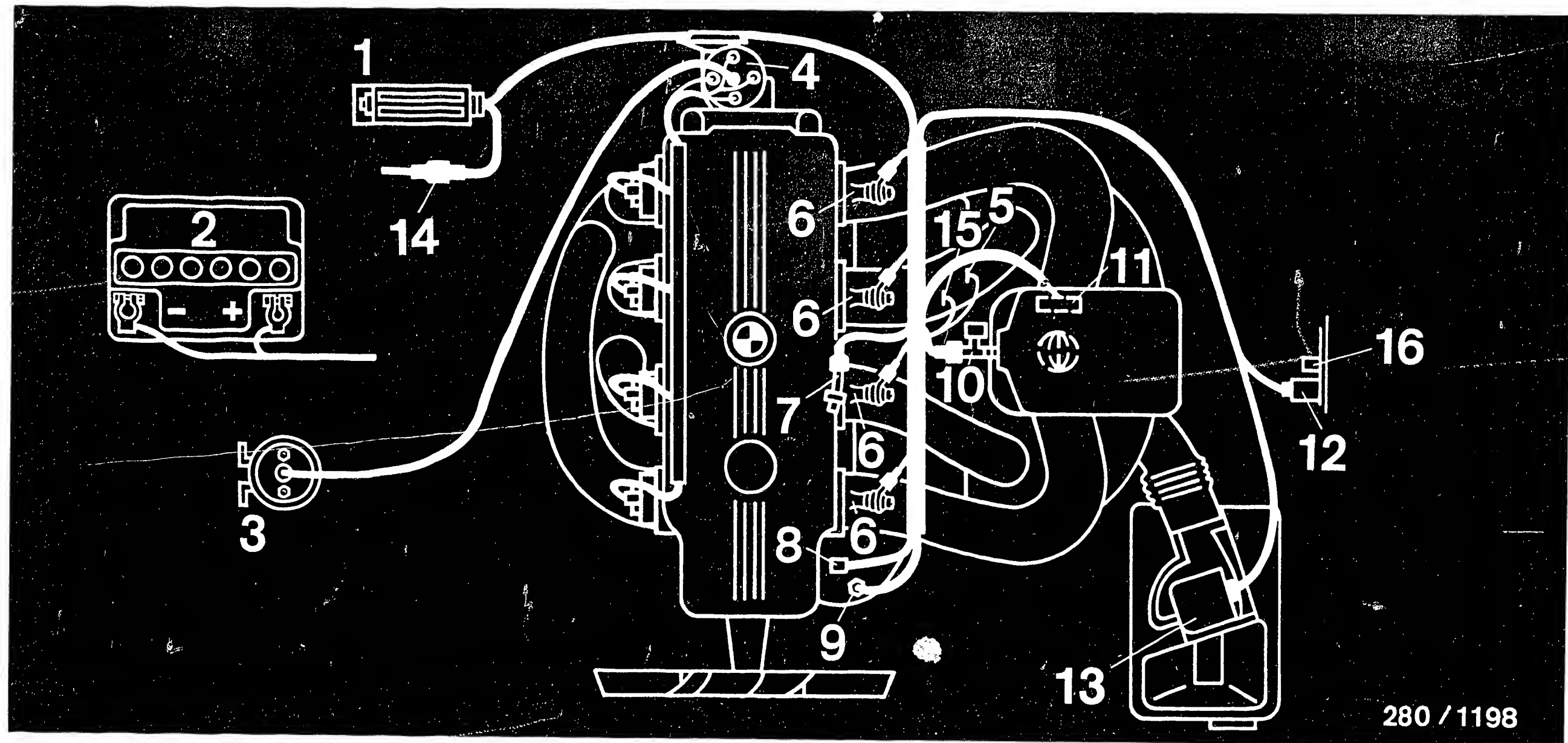
E11

Electrical terminal diagram

BMW



280 / 1197



ELECTRICAL WIRING DIAGRAM BMW EUROPE VERSION (Sweden/Switzerland/Australia version similar)

- | | | | |
|--------------------------|------------------------------------|------------------------------|----------------------------------|
| 1 = Control unit plug | 5 = Ground terminal, output stage | 9 = Thermotime switch | 14 = Plug connec. for Term. TD |
| 2 = Battery | 6 = Electric fuel-injection valves | 10 = Electric starting valve | Term. 15, Term. 11 (control |
| 3 = Ignition coil | 7 = Auxiliary-air device | 11 = Throttle valve switch | unit term. 16) |
| 4 = Ignition distributor | 8 = Temperature sensor II | 12 = Control relay | 15 = Ground terminal, electronic |
| | | 13 = Air-flow sensor | system |
| | | | 16 = Relay for vacuum timing |
| | | | advance (only for Sweden/ |
| | | | Switzerland) |

E12

Electrical wiring diagram

BMW

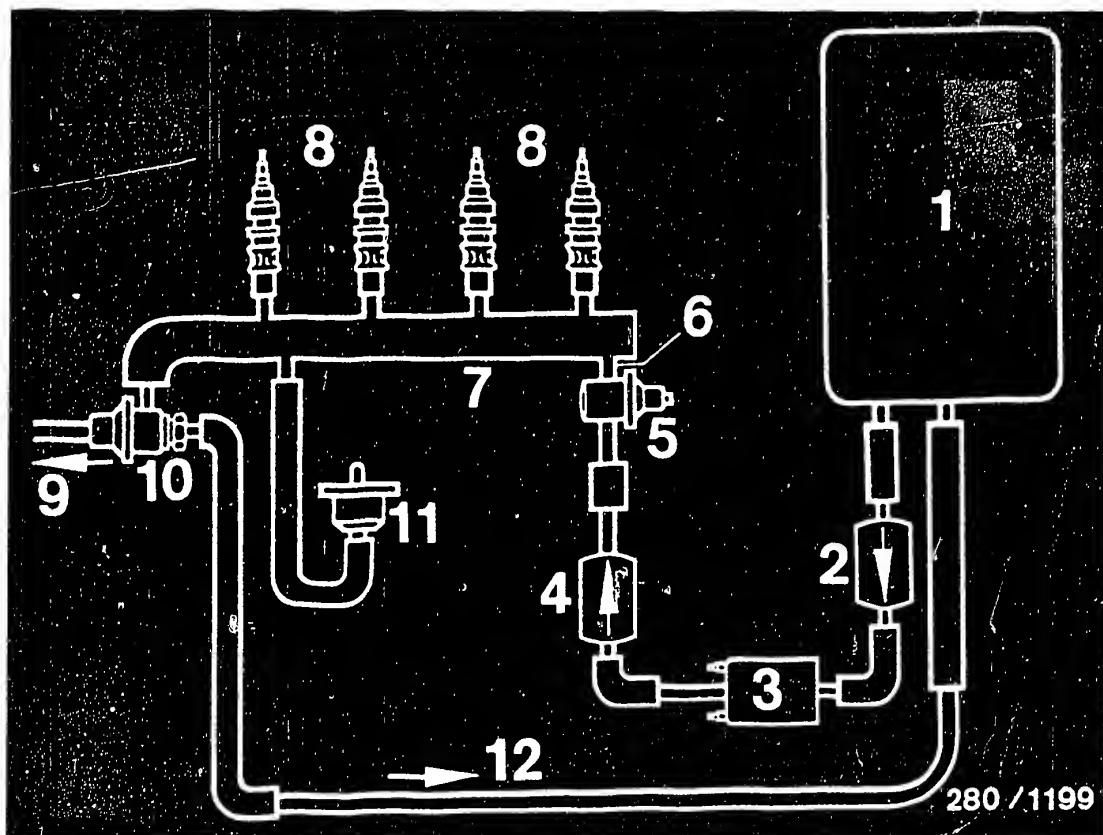


E13

Electrical wiring diagram

BMW

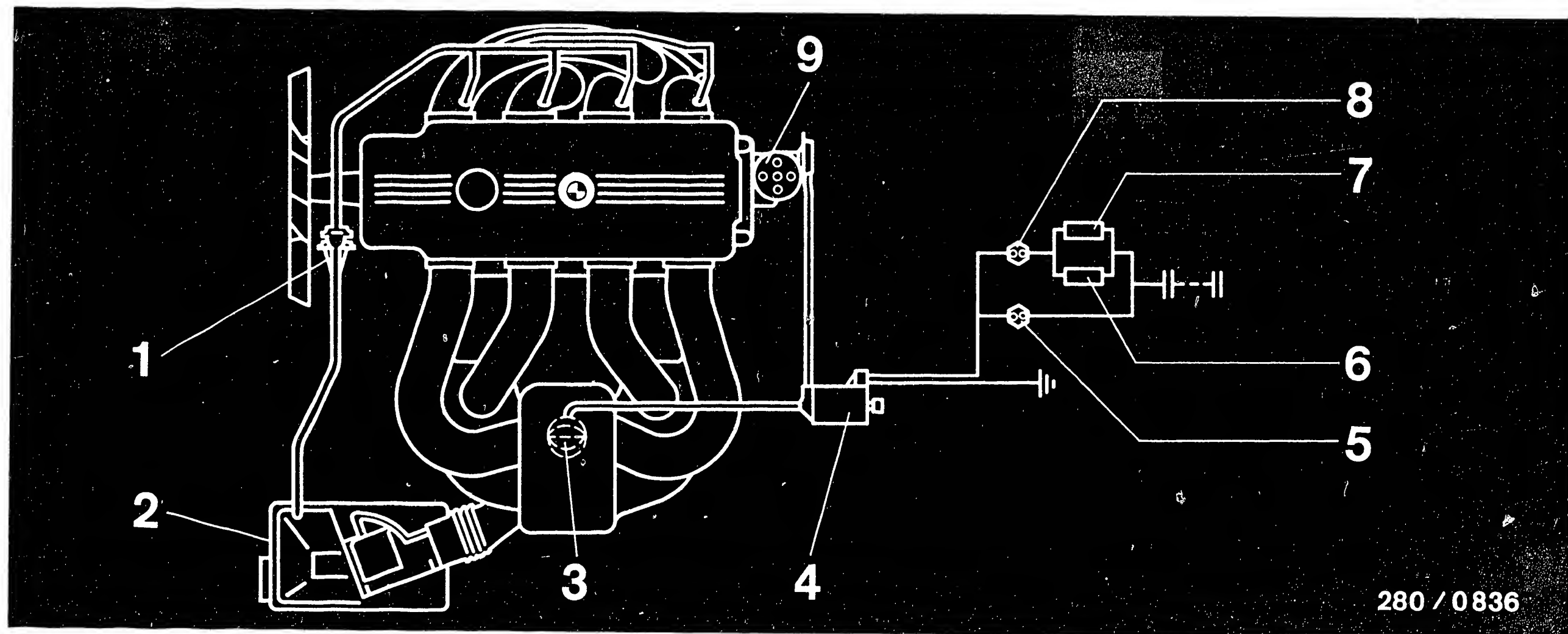




FUEL LINE DIAGRAM

- 1 = Fuel tank
- 2 = Fuel spinner
- 3 = Electric fuel pump
- 4 = Fuel filter
- 5 = Fuel-line-pressure damper cancelled from 8.85
- 6 = Fuel delivery line
- 7 = Fuel-distribution pipe
- 8 = Solenoid-operated injection valves
- 9 = Connection to intake manifold
- 10 = Pressure regulator
- 11 = Start valve
- 12 = Fuel return line





280 / 0836

1 = natural aspiration air valves
2 = Air filter
3 = Throttle valve

4 = Solenoid-operated valve
5 = Temperature switch +17°C
6 = 4th/5th gear switch (not
used for automatic transmissions)

7 = 65 km/hour switch
8 = Temperature switch +55°C
9 = Ignition distributor

Only for models for Sweden/Switzerland:

OPERATION OF THE SECONDARY AIR INDUCTION AND VACUUM ADVANCE

- The air valves supply fresh air to the exhaust gas in the exhaust manifold in order to reduce the values for CO and hydrocarbons to the allowable levels by means of afterburning. For this, the vacuum after the exhaust valves, which has a periodic effect, is used for the operation of the air valves. Using this vacuum, the air valves on their own draw filtered intake air into the exhaust manifold and thus contribute to a reduction in the toxic constituents.
- The vacuum timing advance on the ignition distributor is actuated via a relay, the solenoid-operated change-over valve. Preconditions are a coolant temperature of above +55°C, 4th/5th gear selected (with manual transmission) and speed over 65km/h.

E15

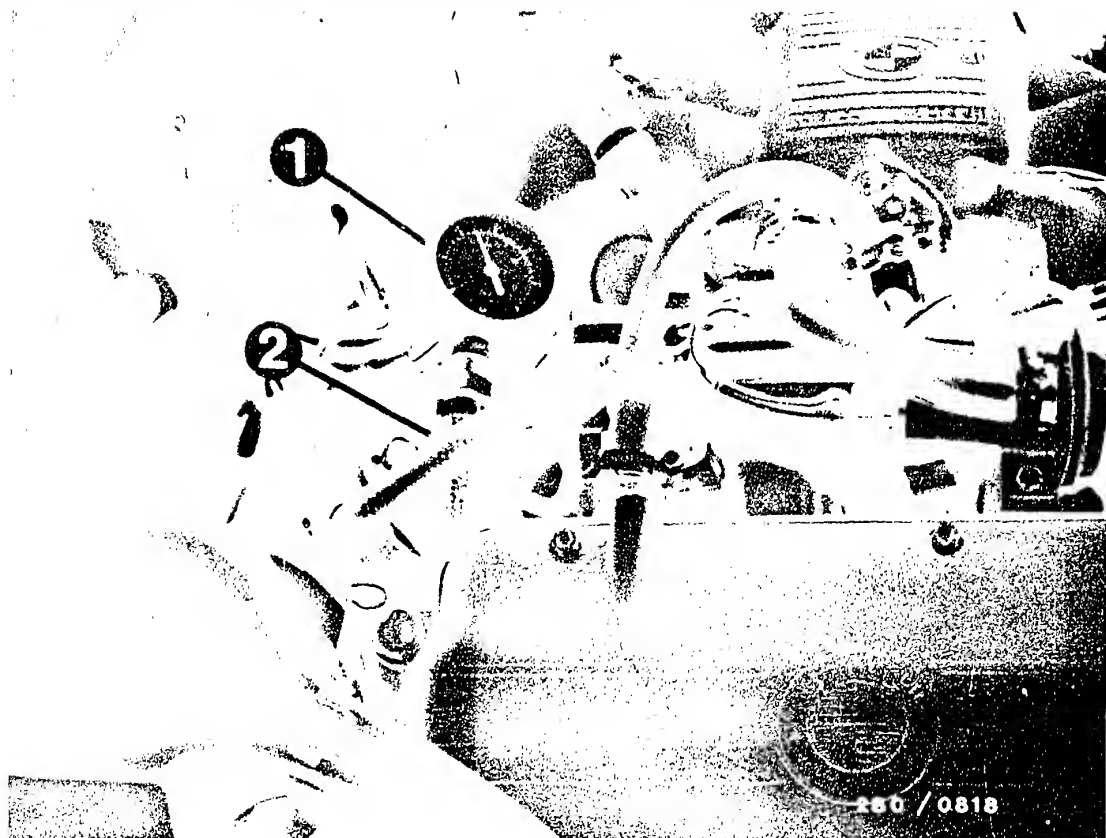
Secondary air induction/timing advance
BMW



E16

Secondary air induction/timing advance
BMW





- 1 = Pressure gauge
2 = Delivery line to fuel-distribution pipe

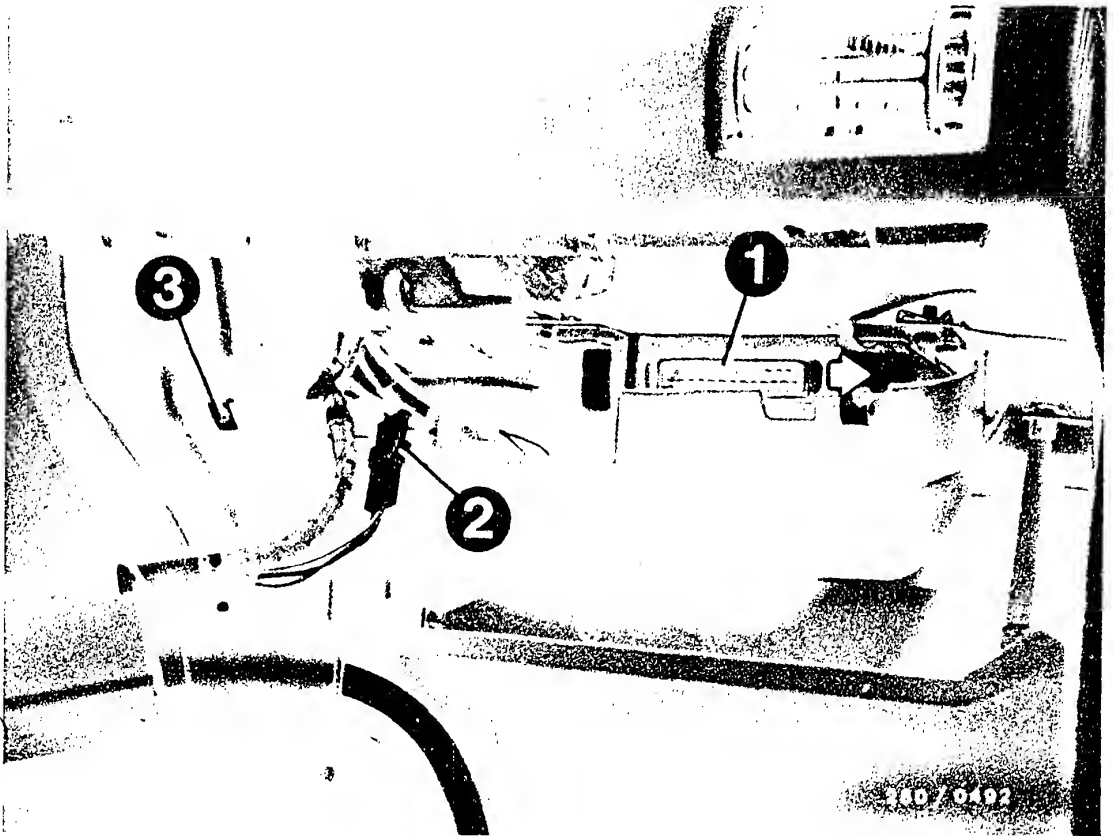
Checking Fuel Pressure

Connect pressure gauge or pressure tester. Remove delivery-line hose from fuel-distribution pipe. Connect pressure gauge.

Make sure there is no leakage at connection.

Note! When unscrewing hose make sure that no fuel gets on hot engine parts.





- 1 = Control unit
- 2 = Plug connection Term. 1 (Europe - lead black/blue)
- 3 = Fastening screws for the control unit cover

INSTALLATION POSITION OF THE COMPONENTS

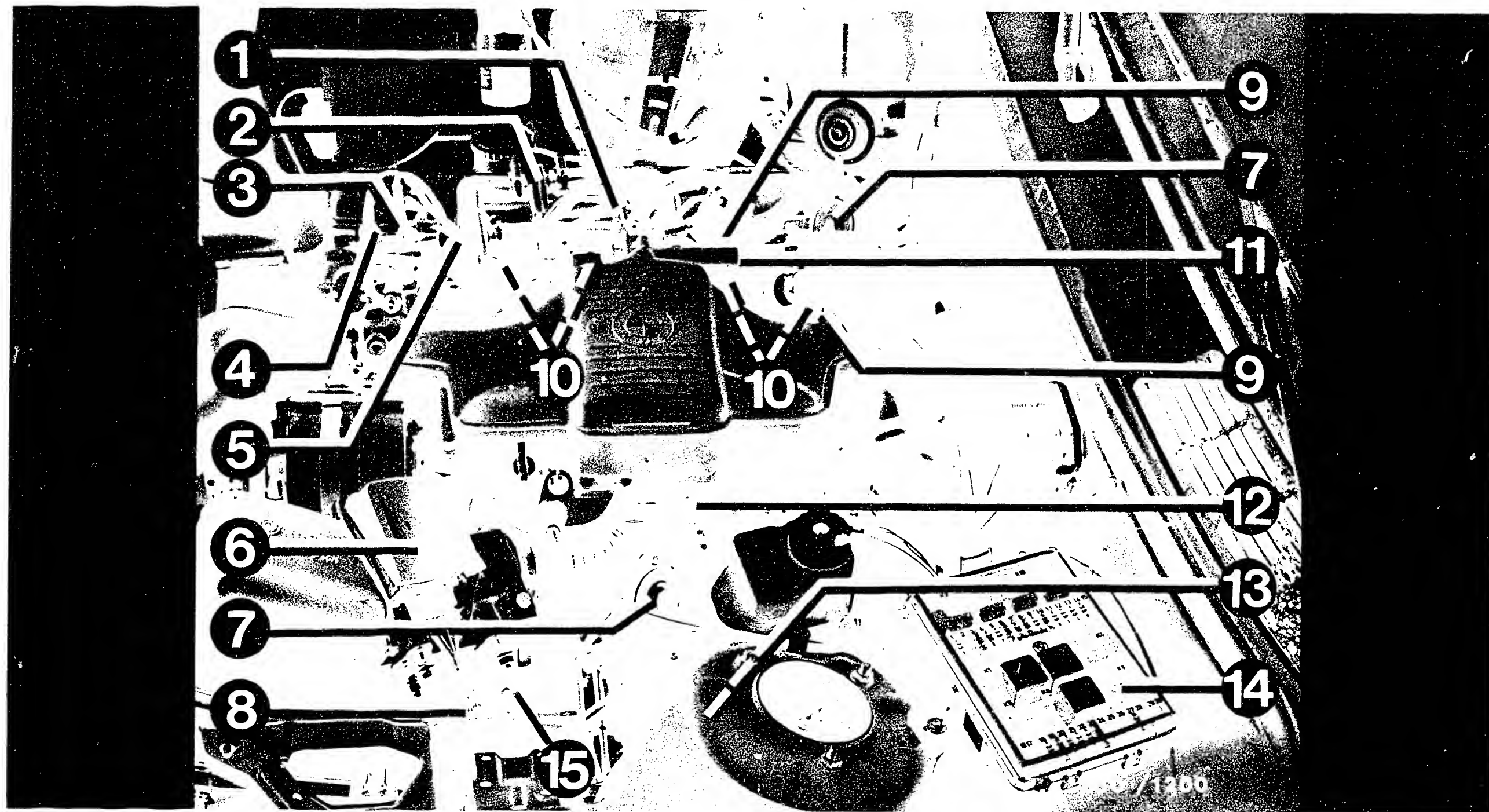
The installation positions are always indicated with reference to the forward direction of vehicle travel.

Control unit:

The control unit is in the passenger compartment, behind a cover in the glove compartment, on the front passenger's side.

To connect universal test adapter, disconnect control unit plug (25 pin), pressing detent in direction of arrow.





Installation position of the components BMW 318i (Europe): (Sweden/Switzerland/Australia version similar)

- | | | |
|--|-------------------------------------|--|
| 1 = Electric starting valve | 6 = Air-flow sensor | 11 = Idle-speed adjusting screw |
| 2 = Auxiliary-air device | 7 = Fuel-line pressure damper | 12 = Throttle valve switch |
| 3 = Temperature sensor II (white plug) | 8 = Control relay (under cover) | 13 = Fuel filter |
| 4 = Thermotime switch (brown plug) | 9 = Ground terminals | 14 = Pump fuse No. 11 |
| 5 = Pressure regulator | 10 = Electric fuel-injection valves | 15 = Relay for vacuum timing advance (only for Sweden/Switzerland) |

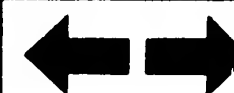
E19

Installation position of the components
BMW



E20

Installation position of the components
BMW



Electric fuel pump: Under the vehicle, on the left in front of the rear wheel.

Model for Sweden/
Switzerland:

Natural aspiration air valves cross-wise in front of the engine block.

E21

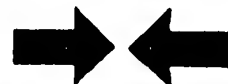
Installation position of the components

BMW



T A B L E O F C O N T E N T S

<u>Section</u>	<u>Coordinates</u>
Special Features/Rapid Diagnosis Chart	F 2
Test Specifications	F 7
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Electric Terminal Diagram (Knock Protection and Idle-Speed Control)	F 11
Electric Wiring Diagram	F 13
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Principle of Lambda Closed-Loop Control	F 16
Checking Fuel Pressure	F 18
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Notes (M.O. Relay, Knock Protection Relay)	F 23



SPECIAL FEATURES:

This microcard contains the LU-Jetronic trouble-shooting instructions for the following model valid at time of printing: 318i Europe catalytic converter and US version from 9.84 to 12.84

- Compression 9.0:1
- Ignition distributor 0 237 002 080/ ... 096
- LU-control unit 0 280 000 310
- O-ring connections on solenoid-operated injection valves and pressure regulator
- Fuel filter located in engine compartment
- Lambda closed-loop control
- Idle speed control (non-Bosch product)
- Knock protection (non-Bosch product)
- Pressure sensor (altitude sensor)
- In-tank pre-supply pump
- Engine speed limitation at 6400 min⁻¹

Remark

The LU-Jetronic in the BMW 318i catalytic converter EU/BMW 318i US essentially corresponds to that of the BMW 318i EU/BMW 318i US

- Similar SIS repair instructions:
SIS microcard BMW 505

RAPID DIAGNOSTIC CHART FOR UNIVERSAL TEST ADAPTER

The rapid diagnostic chart below makes it possible for the experienced L-Jetronic expert to check the electrical portion of the system quickly using the universal test adapter.

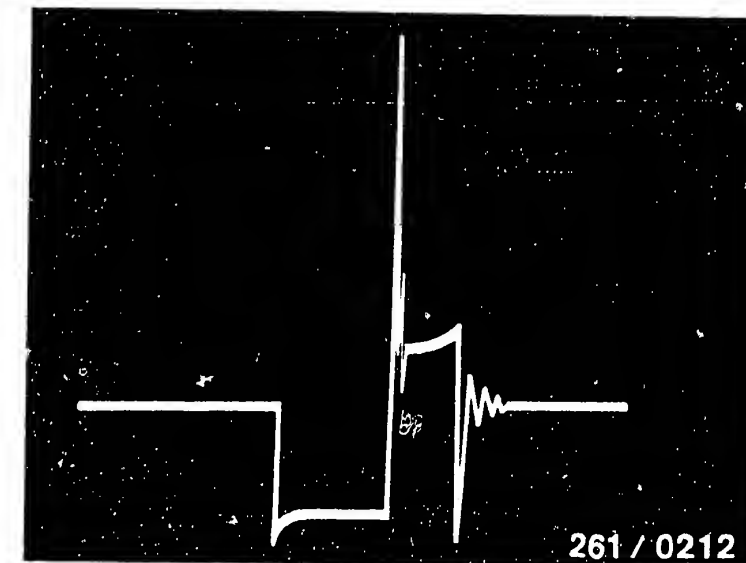
The rapid diagnostic chart includes the following information:

- Switch settings on the universal test adapter
- Sequence of test steps
- Notes on operation of the universal test adapter or other components
- Reading on the multimeter



Rapid diagnostic chart for the universal test adapter

<u>Test step</u>	<u>Switch setting</u>		<u>N o t e s</u>	<u>Test specification</u> (Reading)
	V	Ω		
1	5	-	Shift into neutral and start the engine. Term. 1 at ignition-trigger box Term. no. 16 . At control unit plug Term. 1 to term. 5	see Figure at top
2	6	-	Shift into neutral and start engine. Voltage from control relay Term.87 on the control unit plug Term. 9 to Term. 5	<u>8 ... 15 V</u>
3	7	-	Shift into neutral and start engine. Voltage from starting motor Term.50 on the control unit plug Term. 4 to Term. 5.	<u>8 ... 15 V</u>
4	8	-	Shift into neutral and start engine. Voltage from the pressure sensor on the control unit plug Term. 11 to Term. 5.	Dependent on elevation elevation:300 m: 2 ... 4 V elevation:4000 m: 8 ... 12 V
5	↓	11	Resistance of the temperature sensor NTC I on the control unit plug Term. 8 to Term. 5	100 ... 200 Ω



Primary signal

F3

Rapid diag. chart for univ. test adapter
BMW



F4

Rapid diag. chart for univ. test adapter
BMW



Rapid diagnostic chart for the universal test adapter (continued)

Test step	Switch setting		Measurement	Notes	Test specification (Reading)
	V	Ω			
6	↓	12	Resistance of the air-flow sensor potentiometer on the control unit plug Term.7 to Term. 5	Deflect air-flow sensor flap as far as the stop	<u>60 ... 1000 Ω</u>
7	↓	13	Resistance of the temperature sensor NTC II (engine temperature) on the control unit plug Term. 10 to Term. 5	---	(+15°C...+30°C): <u>1.3...3.6 kΩ</u> +80°C: <u>250...390 Ω</u>
8	↓	14	Resistance ground-output stage on the control unit plug Term. 13 to Term. 5	---	<u>0 ... 10 Ω</u>
9	↓	16	Resistance of the idle contact in the throttle valve switch, on control unit plug Term. 2 to Term. 9	Accelerator pedal in at rest position	<u>0 ... 10 Ω</u>
10	↓	17	Resistance of the full-load contact in the throttle valve switch, on the control unit plug Term. 3 to Term. 9	Step all the way down on the accelerator pedal (full-load setting)	<u>0 ... 10 Ω</u>
11	↓	18	Resistance of all 4 electric fuel-injection valves connected in parallel, on the control unit plug Term. 12 to Term. 9	---	(+15°C...+30°C): <u>7,0...9,5 Ω</u> approx. +80°C: <u>7,2...10,0 Ω</u>

F5

Rapid diag. chart for univ. test adapter
BMW



F6

Rapid diag. chart for univ. test adapter
BMW



TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure 2.8...3.2 bar

Electric fuel pump

- Fuel delivery (measured in the return): min. 650 cm³/30s
- Voltage at connection (under load): min. 12 V
- In-tank pre-supply pump min. 700 cm³ /30s

Thermotime switch (35°/8s):

● Internal electrical resistance at	Between Term. "G" and ground	Between Term. "W" and ground	Between "G" and "W"
Ambient temperature (less than +30°C)	25...40 Ω	0Ω	25...40 Ω
engine at normal operating temperature (above +40°C)	50...80 Ω	100...160Ω	50...80 Ω

Electric starting valve

- internal electrical resistance: 3.5...4.5 Ω
- leakage: max. allowable 1 drop/min.

Idle actuator (non-Bosch product)

- Electrical internal resistance at ambient temperature (+15°C...+30°C) 9 ... 10Ω

Temperature sensor II (engine)

- internal electrical resistance at ambient temperature (+15°...+30°C): 1.3...3.6 kΩ
- engine at normal operating temperature (approx. +80°C): 250...390 Ω

Electric fuel-injection valve (at +20°C)

- internal electrical resistance 15.0...17.5 Ω



Air-flow sensor

- Resistance between

Term. 8 and Term. 5:	340...450 Ω
Term. 7 and Term. 5 (deflect air-flow flap all the way)	60...1000 Ω
Term. 9 and Term. 5:	500...760 Ω
Term. 8 and Term. 9:	160...300 Ω

Pressure sensor (Altitude sensor)

elevation 300 m (977 mbar):	2.0... 4.0 V
elevation 4000 m (616 mbar):	8.0...12.0 V
Resistance between Term. 2 (-) and Term. 3 (+):	2.3...2.5 k Ω

Idle adjustment (engine at normal operating temperature, approx. +80°C)

Manual and automatic transmissions: 700...800 min⁻¹

- CO adjustment via lambda closed-loop control closed-loop mode (sensor connected) integrator output diagnosis socket no. 5: Voltage reading fluctuates between 2 values

Open-loop mode (sensor line taken apart): Voltage reading must equal fluctuating average value.

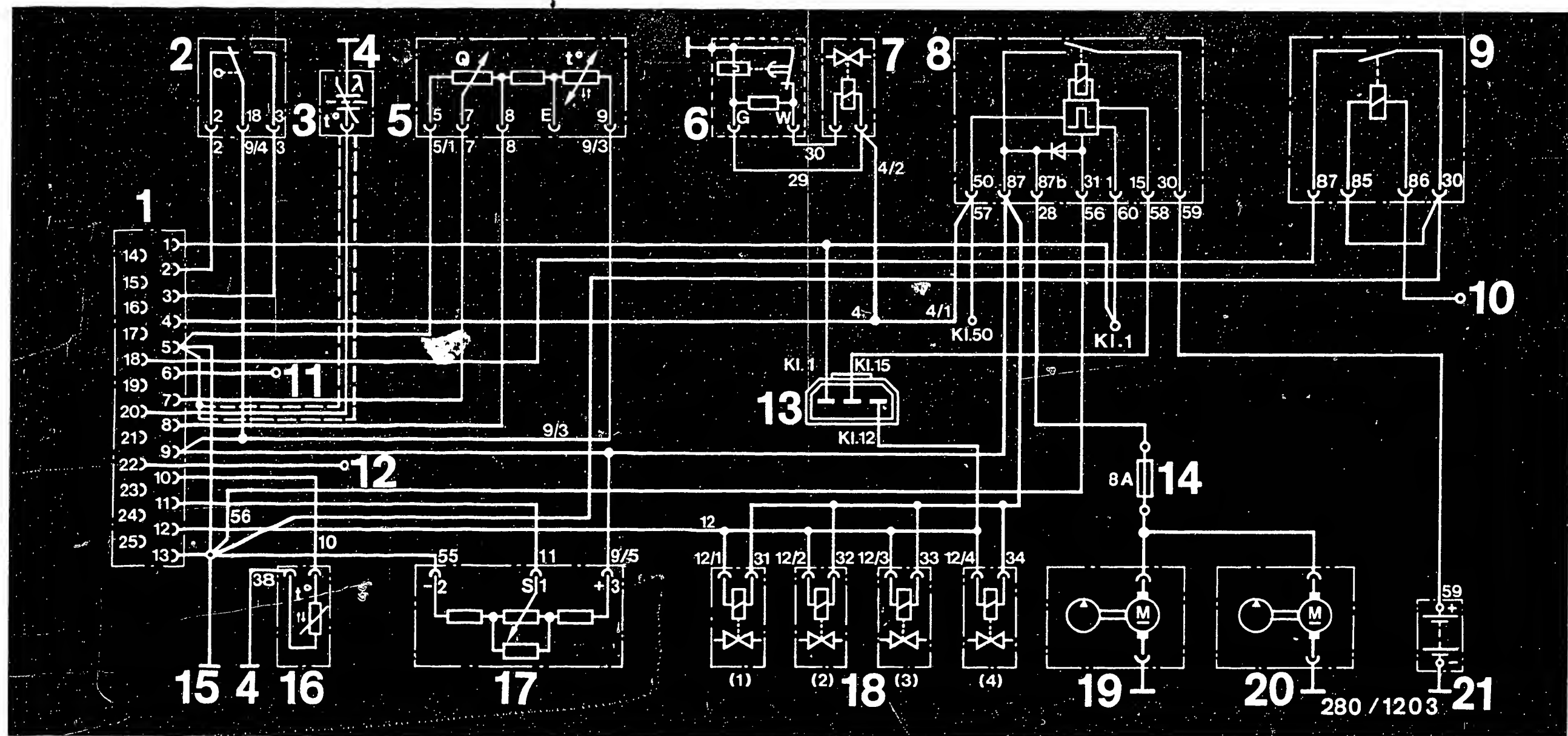
Lambda closed-loop control

- Rich value (take apart sensor line and connect to ground on control unit side): 9 ... 11 V
- Lean value (apply 2 V on sensor line on control unit side): Approx. 0.5 V

Disconnect extractor system for period of exhaust gas measurement and adjustment. Observe accident-prevention regulations.

For settings for ignition, valve clearance, and other engine data, see the Equipment a.Auto Data Microfiche.





Electric Terminal Diagram BMW 318i EU catalytic converter/BMW 318i US, Japan version until 12.84

- | | | | |
|-------------------------------------|--|---|--|
| 1 = Control unit plug | 7 = Start valve | 12 = Integrator output diagnosis socket pin 5 | 16 = Temperature sensor II |
| 2 = Throttle-valve switch | 8 = Control relay | 13 = Connection for injection and on-board computer | 17 = Pressure sensor (altitude sensor) |
| 3 = Lambda sensor | 9 = N.O. relay | 14 = Pump fuse | 18 = Solenoid injection valves |
| 4 = Ground terminal for electronics | 10 = Air-conditioner solenoid switch | 15 = Final stage ground terminal | 19 = Electric fuel pump |
| 5 = Air-flow sensor | 11 = Load signal to knock protection relay term. 4 | | 20 = In-tank pre-supply pump |
| 6 = Thermo-time switch | | | 21 = Battery |

F9

Electric terminal diagram

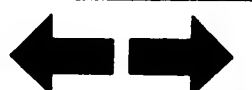
BMW

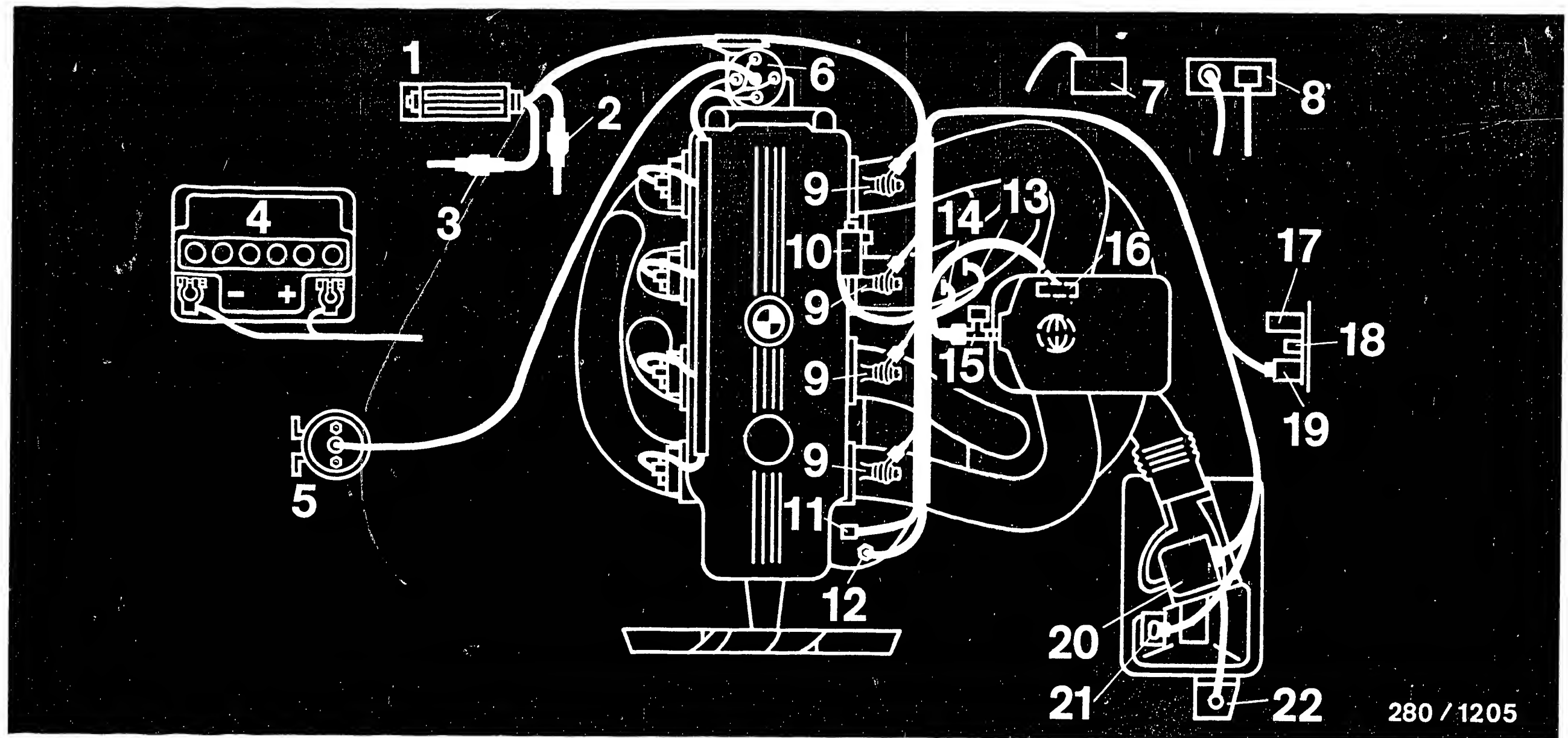


F10

Electric terminal diagram

BMW





ELECTRIC WIRING DIAGRAM BMW 318i EU CATALYTIC CONVERTER (318i US) UNTIL 12.84

- | | | | |
|--|-------------------------------|--------------------------------------|--|
| 1 = Control unit plug | 7 = Solenoid-operated valve | 13 = Ground terminal for electronics | 19 = Control relay |
| 2 = Lambda sensor disconnection point | 8 = Timing-advance unit | 14 = Final stage ground terminal | 20 = Air-flow sensor |
| 3 = Plug connection for term. 15, term. 12 | 9 = Solenoid injection valves | 15 = Start valve | 21 = Pressure sensor (altitude sensor) |
| 4 = Battery | 10 = Idle actuator | 16 = Throttle-valve switch | 22 = Intake-air-temperature sensor |
| 5 = Ignition coil | 11 = Temperature sensor II | 17 = Knock-protection relay | |
| 6 = Ignition distributor | 12 = Thermo-time switch | 18 = N.O. relay | |

F13

Electric wiring diagram

BMW



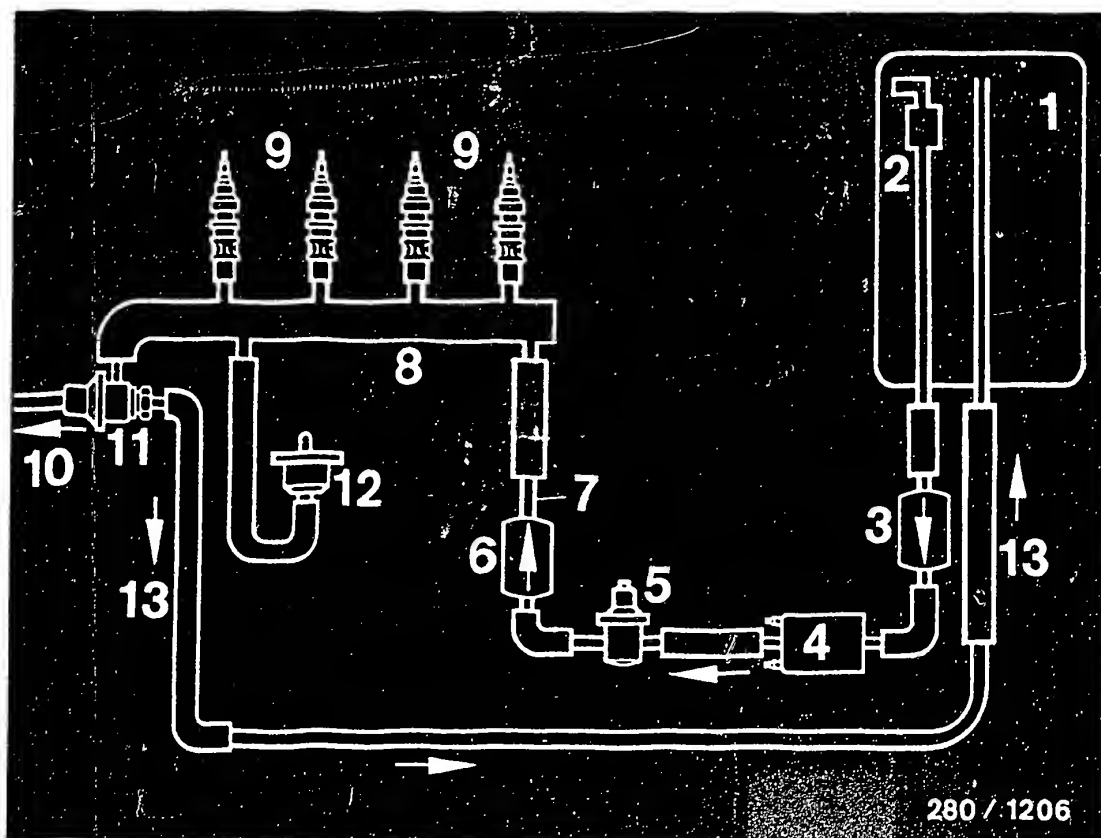
F14

Electric wiring diagram

BMW



280 / 1205



280 / 1206

FUEL LINE DIAGRAM

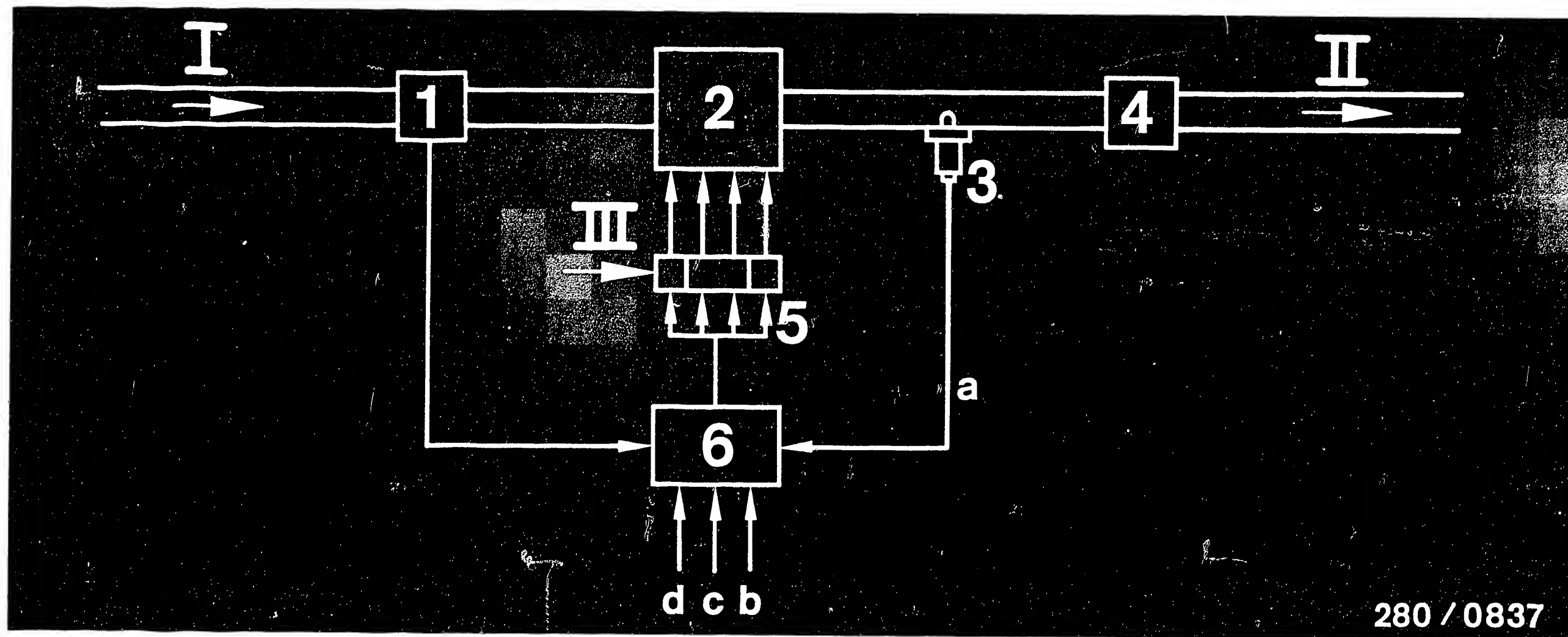
- 1 = Fuel tank
- 2 = In-tank pre-supply pump
- 3 = Fuel spinner
- 4 = Electric fuel pump
- 5 = Fuel-line-pressure damper
- 6 = Fuel filter
- 7 = Fuel-delivery line
- 8 = Fuel-distribution pipe
- 9 = Solenoid injection valves
- 10 = Connection to intake manifold
- 11 = Pressure regulator
- 12 = Start valve
- 13 = Fuel return line

F15

Fuel line diagram

BMW





280 / 0837

1 = Air-flow sensor
2 = Engine
3 = Lambda sensor
4 = 3-way catalytic converter

5 = Electric fuel-injection valves
6 = LU control unit with Lambda closed-loop control

a = Sensor voltage
b = Supply voltage
c = Engine speed
d = Engine temperature

I = Air
II = Exhaust gas
III = Fuel

For US model only: FUNCTION OF THE LAMBDA CLOSED-LOOP CONTROL

With the control circuit that is closed using a special measuring sensor - the lambda sensor - deviations from a given air/fuel ratio can be identified and corrected. The control principle is based on the fact that the oxygen level remaining in the exhaust gas is continually measured by the lambda sensor. This level is an indicator for the composition of the air/fuel mixture supplied to the engine. As a measuring sensor in the exhaust pipe, the lambda sensor provides information as to whether the mixture is richer or leaner than $\lambda = 1$. The lambda sensor reports this deviation to the control unit and the lambda closed-loop control (in the control unit) acts upon the fuel-injection duration and/or the amount of fuel injected as pre-calculated by the fuel-injection control. This regulating to $\lambda = 1$ is a prerequisite if the subsequent 3-way catalytic converter is to make it possible to burn the toxic substances with a good efficiency.

F16

Lambda closed-loop control

BMW

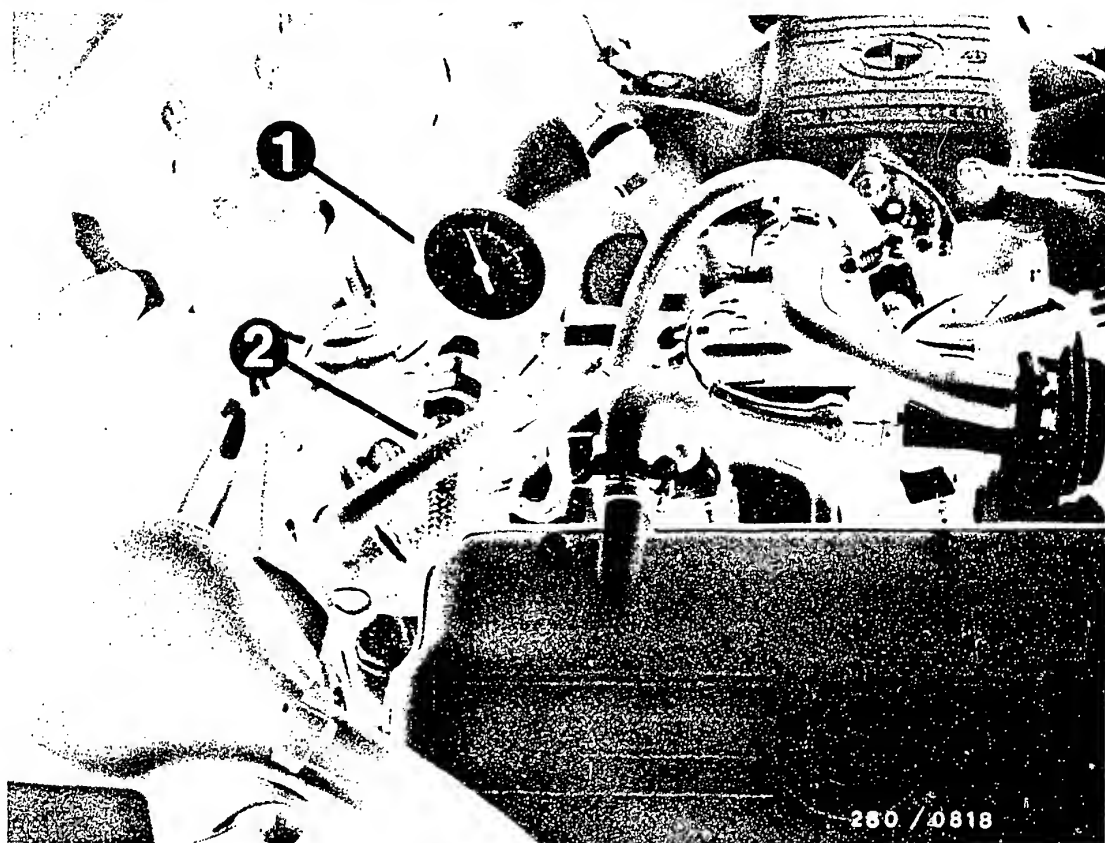


F17

Lambda closed-loop control

BMW





- 1 = Pressure gauge
- 2 = Delivery line to fuel-distribution pipe

Checking Fuel Pressure

Connect pressure gauge or pressure measuring device. Pull off delivery line hose from fuel-distribution pipe. Connect pressure gauge. Make sure there is no leakage at connection.

Note! When removing the hose be careful that no fuel gets on hot engine parts.



INSTALLATION POSITION OF COMPONENTS

The indications "left" and "right" always apply as viewed in forward direction of travel.

Control Unit (upper illustration)

The control unit is located in the passenger side of the passenger compartment, in the glove compartment behind a panel.

- 1 = Control unit
- 2 = Plug connection term. 1
- 3 = Fastening screws for control unit cover

To connect universal test adapter, detach control unit plug (25 pin); to do this, press detent in direction of arrow.

Electric Fuel Pump (middle illustration)

The electric fuel pump is located underneath the vehicle to the left in front of the left rear wheel.

- 1 = Fuel-line-pressure damper
- 2 = Electric fuel pump
- 3 = Fuel delivery line
- 4 = Fuel spinner
- 5 = Fuel return line
- Arrow = Direction of fuel flow

In-tank Immersion Sensor with In-Tank Pre-Supply Pump (lower illustration)

The installation position is in the passenger compartment to the right underneath the rear seat.

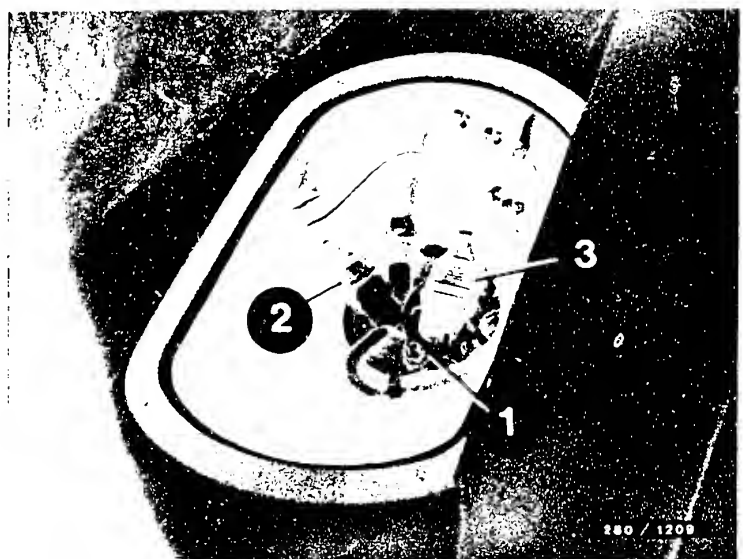
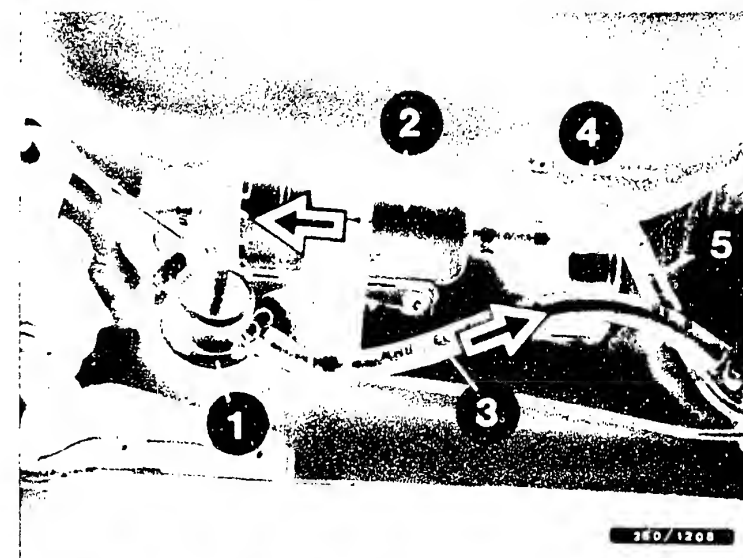
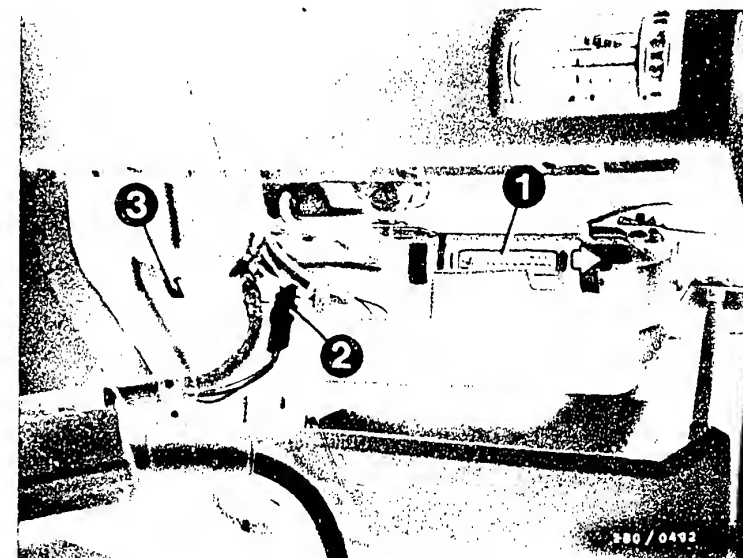
- 1 = Immersion tube sensor with in-tank pre-supply pump
- 2 = Electric connection - pre-supply pump
- 3 = Electric connection - immersion tube sensor

Checking Immersion Tube Sensor

Resistance measurement between term. G and term. 31 at float positions "empty" and "full". The course of the resistance curve (deflection) must show no discontinuity.

Empty = Approx. 2.5 ... 4.0 Ω

Full = Approx. 56.5... 61.0 Ω



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Installation position of components

BMW

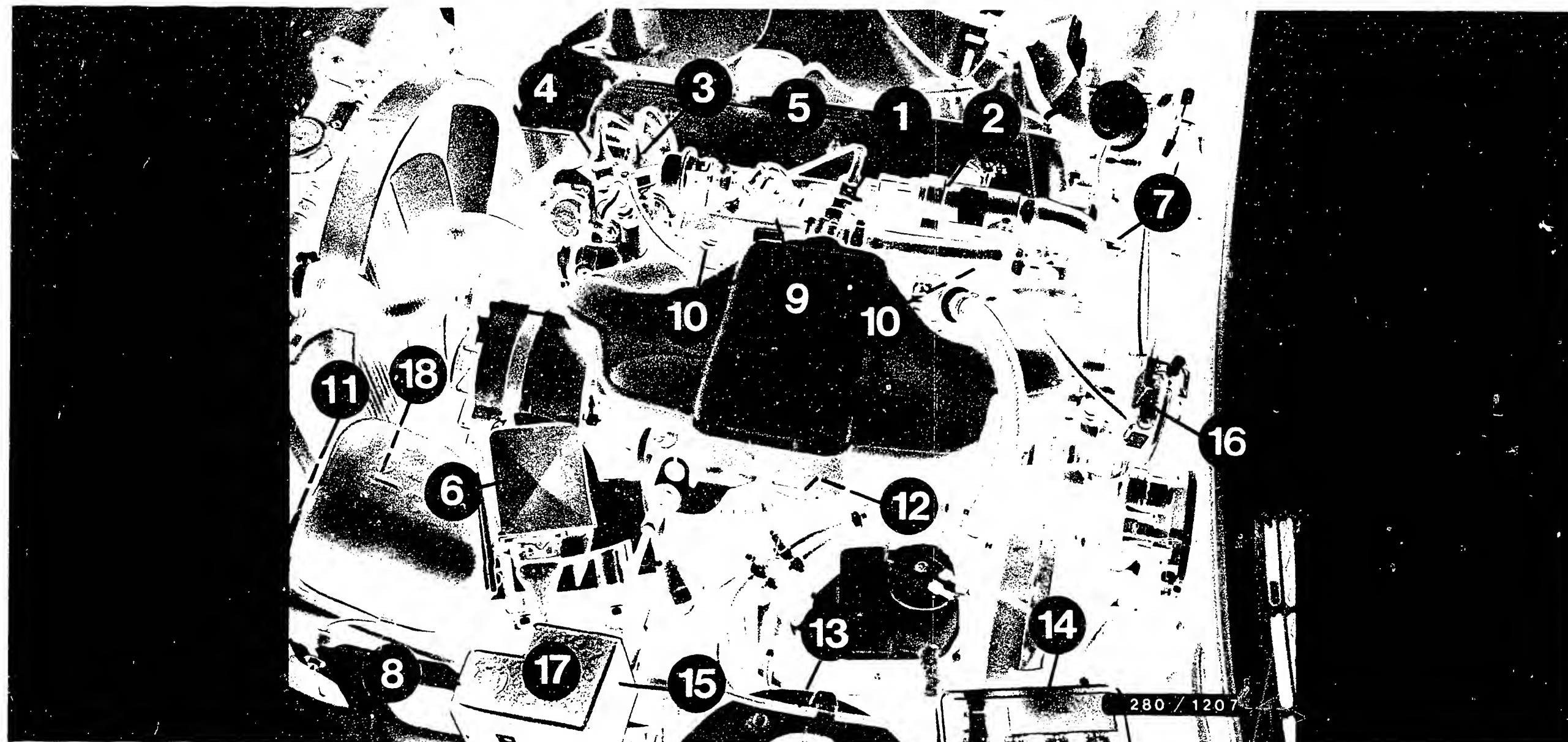


F20

Installation position of components

BMW



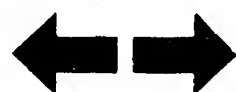


Installation Position of Components (Continued) BMW 318i (Europe Catalytic Converter) BMW 318i US

- | | | |
|--|---|--|
| 1 = Start valve | 7 = Fuel-line-pressure damper | 13 = Fuel filter |
| 2 = Idle actuator (non-Bosch product) | 8 = Control relay (under panel) | 14 = Pump fuse no. 11 |
| 3 = Temperature sensor II (white plug) | 9 = Ground terminal | 15 = Knock-protection relay |
| 4 = Thermo-time switch (brown plug) | 10 = Solenoid-operated injection valves | 16 = Solenoid-operated valve |
| 5 = Pressure regulator | 11 = Temperature sensor (intake air) | 17 = N.O. relay |
| 6 = Air-flow sensor | 12 = Throttle-valve switch | 18 = Pressure sensor (altitude sensor) |

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Installation position of components
BMW



F22

Installation position of components
BMW



Installation Position of Components (Continued)

The upper illustration (1) shows the disconnection point (green line 1-pin) for the lambda sensor (illustration above applies to 318i Europe. Catalytic converter and US version from 1.85). Center illustration shows diagnostic connector top view forward on engine block near thermo-time switch - 1 = Integrator output.

Lower illustration shows installed position of lambda sensor (similar to 318i Europe catalytic converter and US version).

Note:

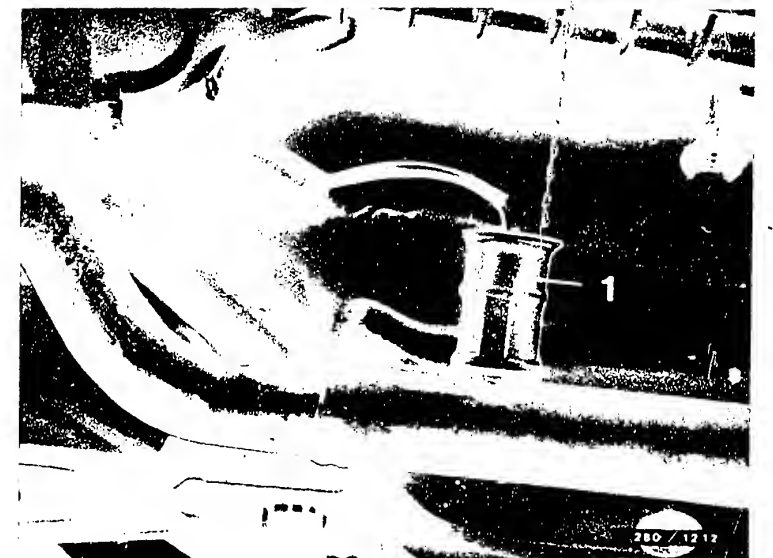
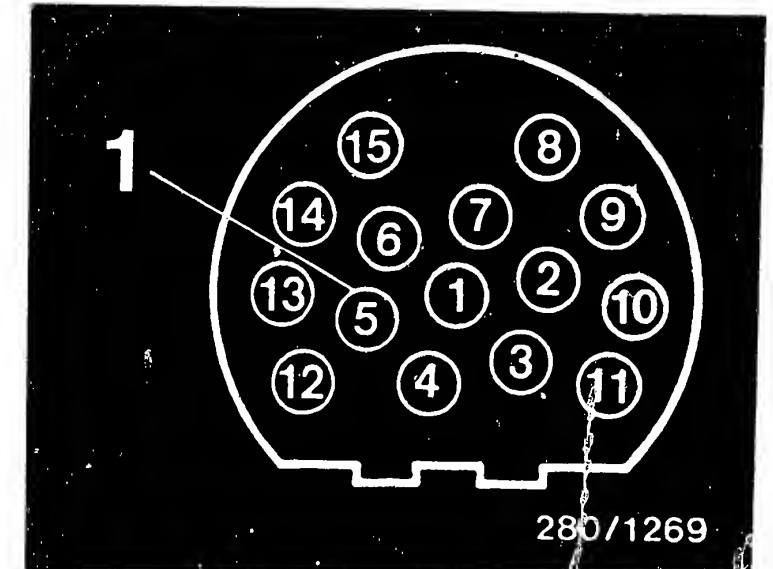
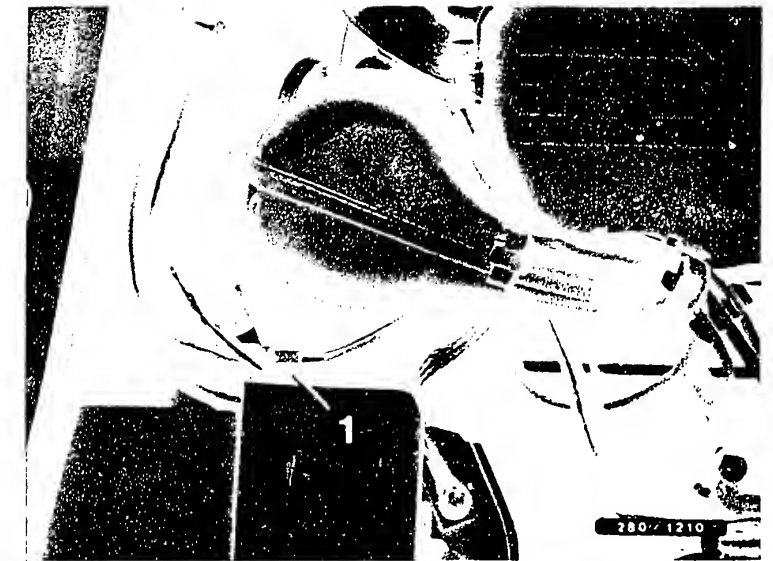
N.O. relay: Suppresses overrun cutoff when air-conditioning is off.

Knock-protection relay:

For high outside temperatures together with high loads, a protective circuit is integrated in the ignition angle control. This protective circuit intervenes in or interrupts the vacuum timing advance via a solenoid-operated valve.

The following control possibilities result from this protective circuit:

1. Run-up and idle-speed assist; vacuum timing advance is effective at intake-air temperatures lower than 10°C and coolant water temperatures lower than 45°C.
2. Quick attainment of normal operating temperature for engine and cat. converter; ignition angle retarding as a result of low coolant water temperature under 45°C and exterior air temperature greater than 10°C. Vacuum timing advance is not operative.
3. In order to avoid an overlap of the ignition angle curve with the knock limit curve (operating temperature greater than 45°C); at a load corresponding to an injection duration greater than 2.85 ms and an intake-air temperature greater than 38°C, ignition angle advance occurs solely via centrifugal advance. The solenoid valve has closed and the intake manifold vacuum becomes ineffective.



F23

Installation position of components

BMW



F24

Installation position of components

BMW



T A B L E O F C O N T E N T S

Section

Coordinates

Special features/rapid diagnosis chart.....	G 2
Test specifications.....	G 7
Electrical terminal diagram	G 9
Electrical terminal diagram (knock protection and low-idle-speed control).....	G 11
Electrical wiring diagram.....	G 13
Fuel line diagram.....	G 15
Lambda closed-loop control.....	G 16
Checking fuel pressure / bucking.....	G 18
Installation position of components.....	G 19
Notes.....	G 23



SPECIAL FEATURES

This microcard contains the LU-Jetronic trouble-shooting instructions for the following models valid at press date:

- 318i Europe with catalytic converter, 1.85 only
- 318i US version from 1.85
- Compression 9.0 : 1
- Ignition distributor 0 237 002 096
- LU control unit 0 280 000 328
- O-ring connection of solenoid-operated injection valves and pressure regulator
- Fuel filter located in engine compartment
- Lambda closed-loop control
- Idle-speed control (non-Bosch product)
- Idle stabilization (non-Bosch product)
- Knock protection (non-Bosch product)
- Pressure sensor (altitude sensor)
- In-tank pre-supply pump
- Heated lambda sensor
- t_D -release
- Engine speed limitation at 6400 min^{-1}

Remark

The LU Jetronic in the BMW 318i catalytic converter EU/BMW 318i US corresponds essentially to that of the BMW 318i EU/BMW 318i US.

- Similar SIS repair instructions:
SIS microcard BMW 505

RAPID DIAGNOSIS CHART FOR THE UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart provides the experienced L-Jetronic specialist with the ability to rapidly test the electrical components of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

- Switch positions on universal test adapter
- Test step sequence
- Remarks on operation of universal test adapter or other components
- Readings on multimeter


G2

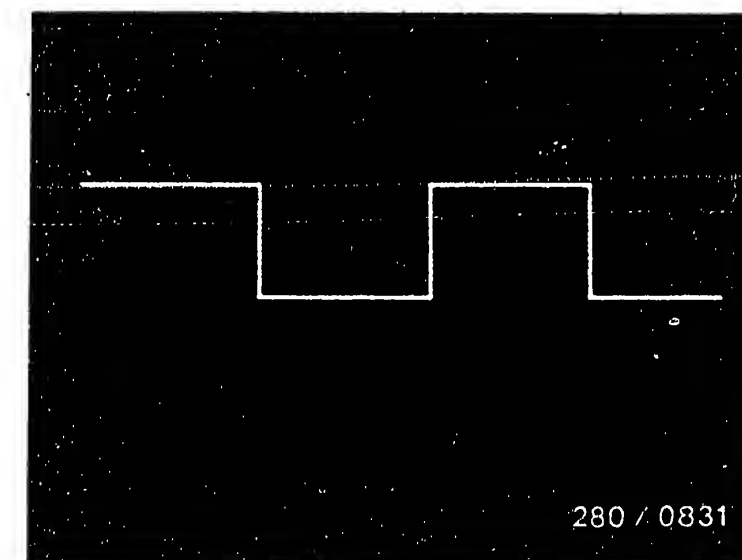
Rapid diagnosis chart

BMW



Rapid Diagnosis Chart for Universal Test Adapter

Test Step	Switch Position		Remarks	Test Specifications (reading)
	V	Ω		
1	5	-	Disengage gear and start. t_D signal at ignition trigger box term. 16. At control unit plug term. 1 to term. 5	See upper figure
2	6	-	Disengage gear and start. Voltage from control relay term. 87 at control unit plug term. 9 to term. 5	8 ... 15 V
3	7	-	Disengage gear and start. Voltage from starting motor term. 50 at control unit plug term. 4 to term. 5.	8 ... 15 V
4	8	-	Disengage gear and start. Voltage from pressure sensor at control unit plug term. 11 to term. 5.	Height-dependent 300 m altitude: 2 ... 4 V 4000 m altitude: 8 ... 12 V
5		11	Resistance combination in air-flow sensor term. 8 to term. 5.	100 ... 200 Ω



t_D signal

G3

Rapid diagnosis chart

BMW









G4

Rapid diagnosis chart

BMW



Rapid Diagnosis Chart for Universal Test Adapter (continued)

<u>Test Step</u>	<u>Switch Position</u>		<u>Measurement</u>	<u>Remarks</u>	<u>Test Specifications (reading)</u>
	V	Ω			
6		12	Resistance of air-flow sensor potentiometer at control unit plug term. 7 to term. 5	Deflect sensor plate to stop.	<u>60 ... 1000 Ω</u>
7		13	Resistance of temperature sensor NTC II (engine temperature) at control unit plug term. 10 to term. 5.	---	(+15°C...+30°C): <u>1.3...3.6 kΩ</u> +80°C: <u>250...390 Ω</u>
8		14	Resistance ground output stage at control unit plug term. 13 to term. 5	---	<u>0 ... 10 Ω</u>
9		16	Resistance of idle contact in throttle-valve switch, at control unit plug term. 2 to term. 9	Accelerator pedal in rest position	<u>0 ... 10 Ω</u>
				Slightly depress accelerator pedal	<u>$\infty \Omega$</u>
10		17	Resistance of full-load contact in throttle-valve switch at control unit plug term. 3 to term. 9	Accelerator pedal in rest position	<u>$\infty \Omega$</u>
				Accelerator pedal fully depressed (full-load position)	<u>0 ... 10 Ω</u>
11		18	Resistance of all 4 parallel-connected solenoid-operated injection valves at control unit plug term. 12 to term. 9	---	(+15°C...+30°C): <u>7.0...9.5 Ω</u> +80°C: <u>7.2...10.0 Ω</u>

G5

Rapid diagnosis chart

BMW


G6

Rapid diagnosis chart

BMW



TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure 2.8...3.2 bar

Electric fuel pump

- Delivery quantity
(measured in return): min. 650cm³/30s
- Terminal voltage (under load): min. 12 V
- In-tank pre-supply pump min. 700cm³/30s

Thermo-time switch (35°/8s):

● Electrical internal resistance at	Between term. "G" and ground	Between term. "W" and ground	Between terms. "G" and "W".
Ambient temperature (under +30°C)	25...40Ω	Ω	25...40Ω
Operating temperature (above +40°C)	50...80Ω	100...160Ω	50...80Ω

Start valve

- Electrical internal resistance: 3.5...4.5 Ω
- Leakage: maximum permissible 1 drop/min.

Idle actuator (Non-Bosch product)

- Electrical internal resistance at ambient temperature (+15°C...+30°C): 9...10 Ω

Temperature sensor II (engine)

- Electrical internal resistance at
Ambient temperature (+15°C....+30°C): 1.3...3.6 kΩ
Operating temperature (approx. +80°C): 250...390 Ω

Solenoid-operated injection valve (at +20°C)

- Electrical internal resistance: 14.5...17.0 Ω

Lambda-sensor heating

- Electrical internal resistance (PTC): 1.0...15.0 Ω



Air-flow sensor

- Resistance between
Term. 8 and term. 5: 340...450 Ω
Term. 7 and term. 5 (fully deflect
sensor flap) , 60...1000 Ω
Term. 9 and 5.: 500...760 Ω
Term. 8 and 9.: 160...300 Ω

Pressure sensor (altitude sensor)

- 300 m altitude (977 mbar): 2.0...4.0 V
- 4000 m altitude (616 mbar): 8.0...12.0 V
- Resistance between term. 2 (-)
and term. 3 (+): 2.3...2.5 k Ω

Idle speed adjustment (engine at operating
temperature, approx. 80°C)

Manual and automatic trans.: 700...800 min⁻¹

- CO adjustment via lambda Voltage reading
closed-loop control operation fluctuates between 2
(sensor connected), integrator values
output diagnosis socket no. 5:

Open-loop operation (sensor
lead separated): Voltage reading must
equal fluctuating mean
value.

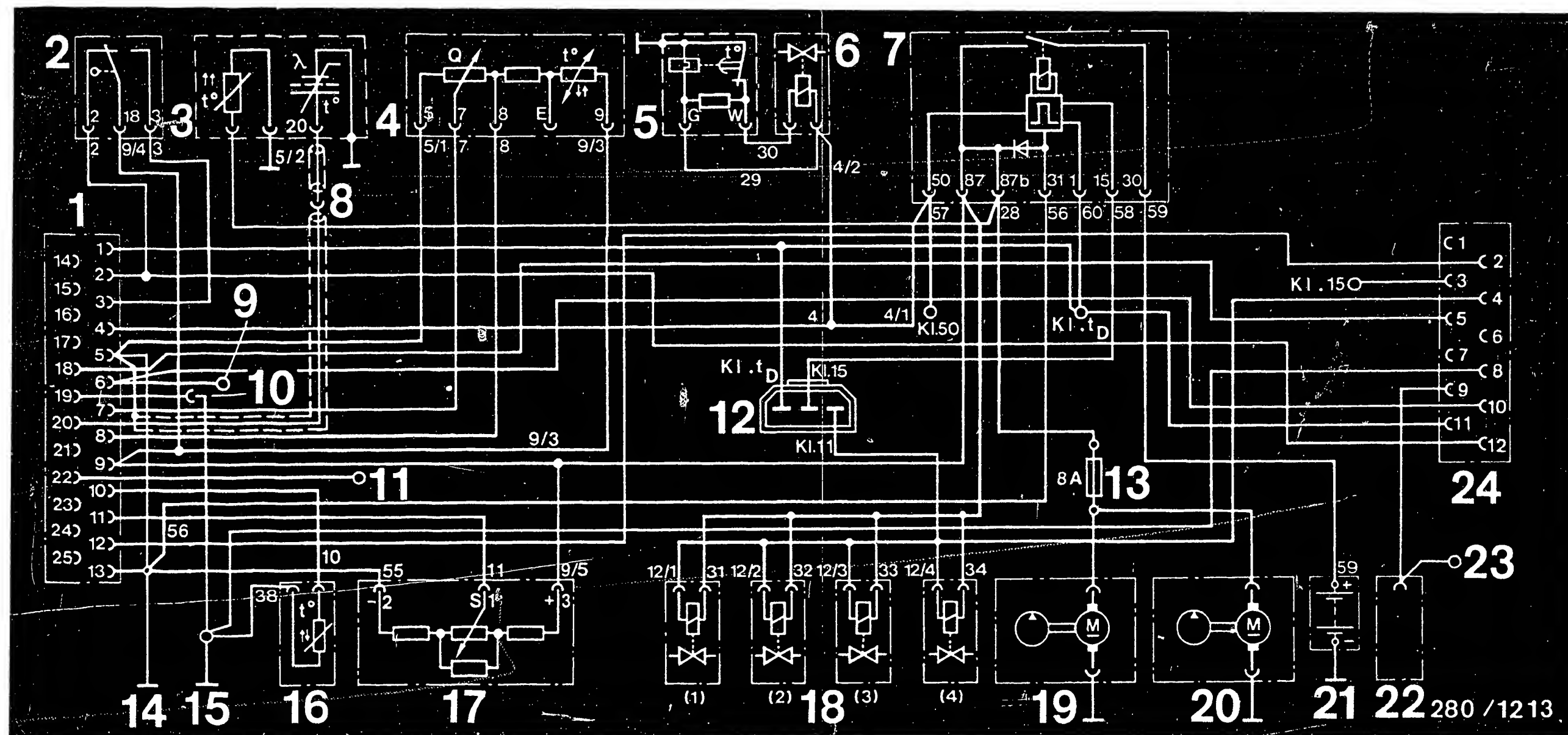
Lambda closed-loop control

- Rich value (separate sensor lead
and connect to ground on
control unit side): 9 ... 11 V
- Lean value (apply 2 V to sensor
lead on control unit side): approx. 0.5 V

Switch off suction plant for period of exhaust
measurement adjusting. Observe safety precautions.

For setting values for ignition, and valve plate, and
other technical engine data, see equipment and
Autodata microcard.





Electrical Terminal Diagram BMW 318i EU Catalytic Converter 1.85 only; BMW 318i US, Japan Version from 1.85

- | | | | |
|---------------------------|---|---|---|
| 1 = Control unit plug | 8 = Lambda sensor plug connection | 12 = Connection for injection and on-board computer | 18 = Solenoid-operated injection valves |
| 2 = Throttle-valve switch | 9 = Load signal to knock-control relay term. 4 | 13 = Pump fuse | 19 = Electric fuel pump |
| 3 = Heated lambda sensor | 10 = Data encoding open. Connected = 1 % leaner | 14 = Output stage ground terminal | 20 = In-tank pre-supply pump |
| 4 = Air-flow sensor | 11 = Integrator output diagnosis socket pin 5 | 15 = Electronics ground terminal | 21 = Battery |
| 5 = Thermo-time switch | | 16 = Temperature sensor II | 22 = A/C solenoid-operated switch |
| 6 = Start valve | | 17 = Pressure sensor (altitude sensor) | 23 = To idle-speed regulator term. 11 |
| 7 = Control relay | | | 24 = Relay for idle stabilization |

G9

Electrical terminal diagram

BMW

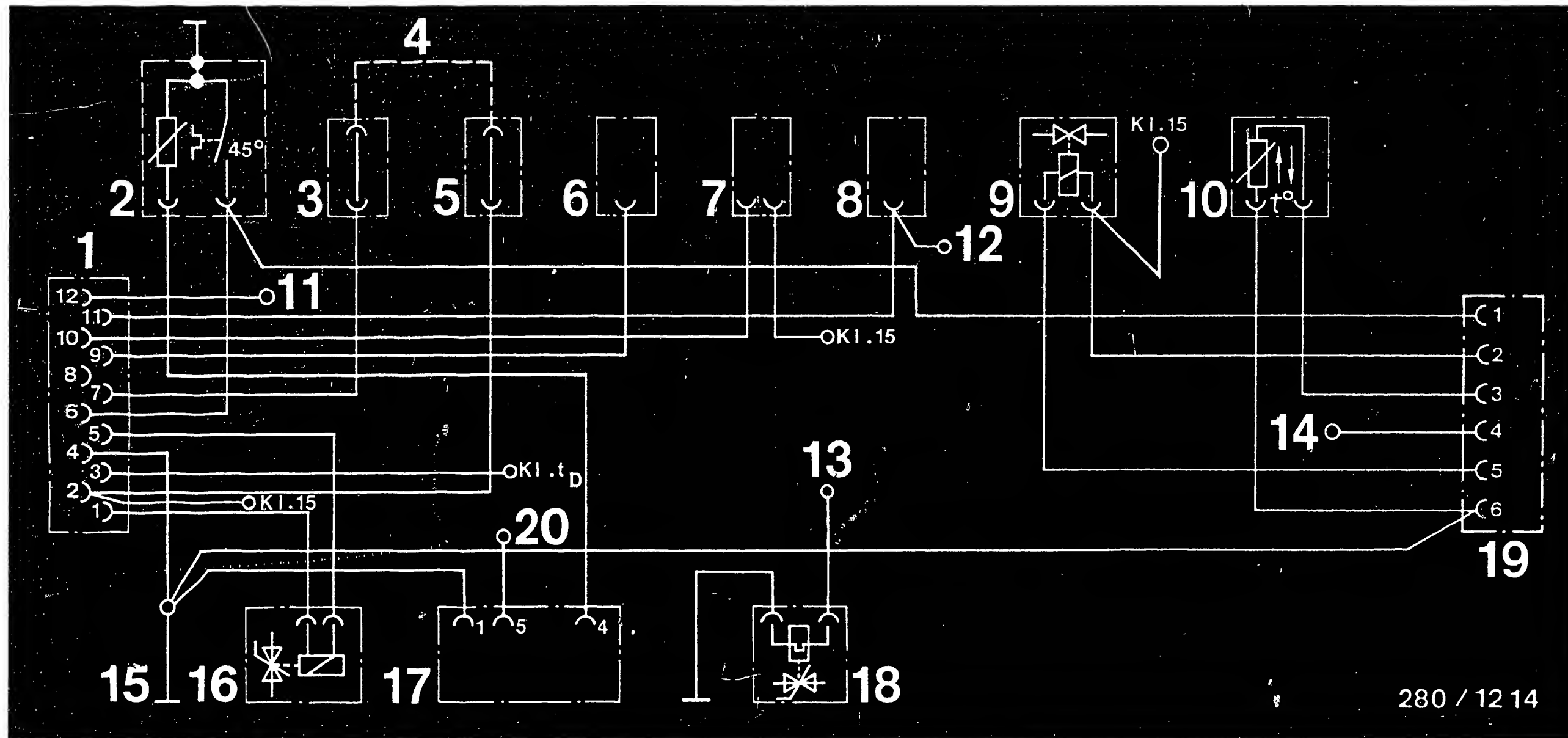


G10

Electrical terminal diagram

BMW





280 / 12 14

Electrical Terminal Diagram (Knock Protection and Low-Idle-Speed Control), Non-Bosch Products
BMW 318i EU Catalytic Converter 1.85 only, BMW 318i US Version from 1.85

- | | | | |
|----------------------------------|--|--|--|
| 1 = Idle-speed regulator | 7 = Temperature switch 0°C | 12 = To relay for idle stabilization term. 9 | 17 = Diagnosis socket |
| 2 = Remote thermometer pickup | 8 = A/C solenoid-operated switch | 13 = To control relay term. 87 | 18 = Auxiliary-air device, for after-sales service instead of idle actuator and idle-speed regulator |
| 3 = Auto. trans. connection | 9 = Solenoid-operated valve | 14 = LU control unit term. 6 | 19 = Knock-protection relay |
| 4 = Connected with manual trans. | 10 = Temperature sensor intake-air snorkel | 15 = Electronics ground terminal | 20 = To LU control unit term. 22 |
| 5 = Connection term. 15 | 11 = To LU control unit term. 2 | 16 = Idle actuator | |
| 6 = A/C wiring harness | | | |

G11

Electrical terminal diagram

BMW

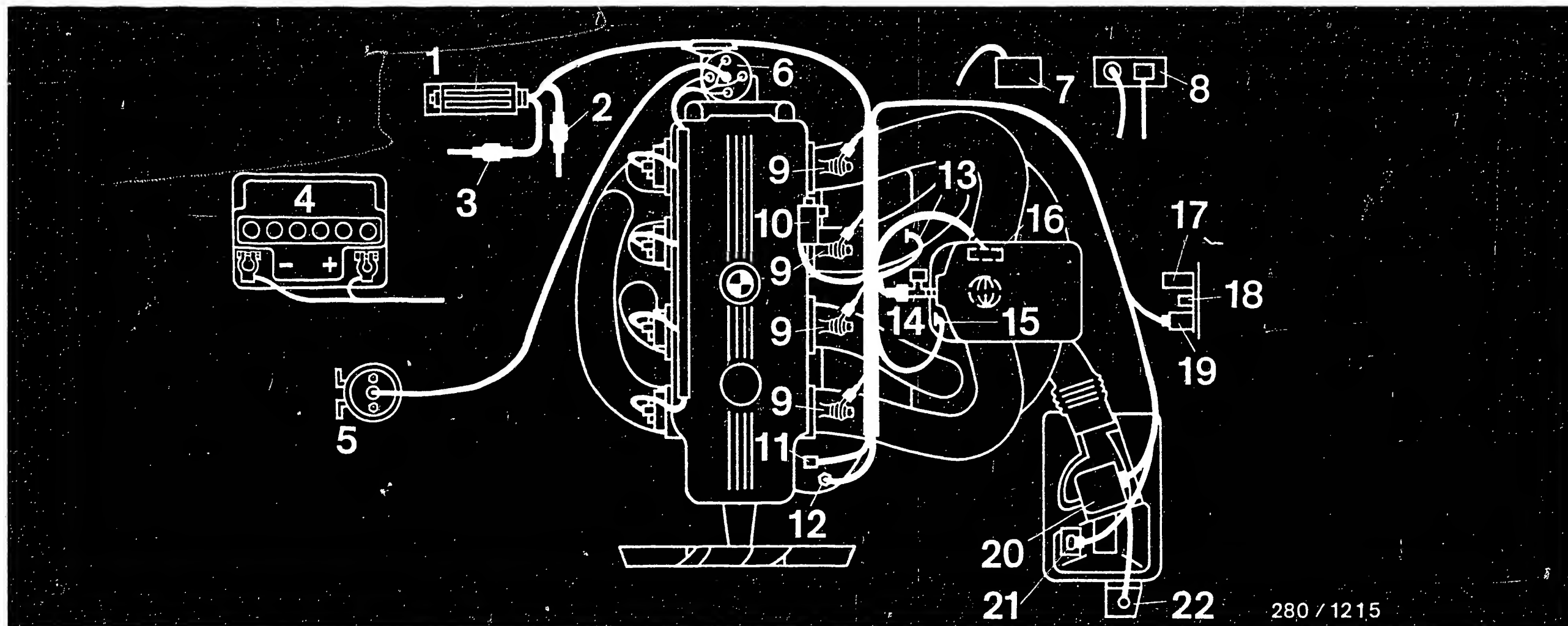


G12

Electrical terminal diagram

BMW





280 / 1215

ELECTRICAL WIRING DIAGRAM BMW 318i EU CATALYTIC CONVERTER, 1.85 only, 318i US VERSION FROM 1.85

- | | | | |
|--|--|-----------------------------------|--|
| 1 = Control unit plug | 6 = Ignition distributor | 12 = Thermo-time switch | 18 = Relay for idle stabilization |
| 2 = Lambda sensor disconnection point | 7 = Solenoid-operated valve | 13 = Output stage ground terminal | 19 = Control relay |
| 3 = Plug connection for term. 15, term. 11 | 8 = Spark-advance unit | 14 = Start valve | 20 = Air-flow sensor |
| 4 = Battery | 9 = Solenoid-operated injection valves | 15 = Electronics ground terminal | 21 = Pressure sensor (altitude sensor) |
| 5 = Ignition coil | 10 = Idle actuator | 16 = Throttle-valve switch | 22 = Intake-air temperature sensor |
| | 11 = Temperature sensor II | 17 = Knock-protection relay | |

- Operation: At idle speed above 1500 min^{-1} , the relay switches off actuation of solenoid-operated injection valves, until engine speed is again below 1500 min^{-1} .
When air conditioning is switched on, overrun cut-off is non-operational.

G13

Electrical terminal diagram

BMW

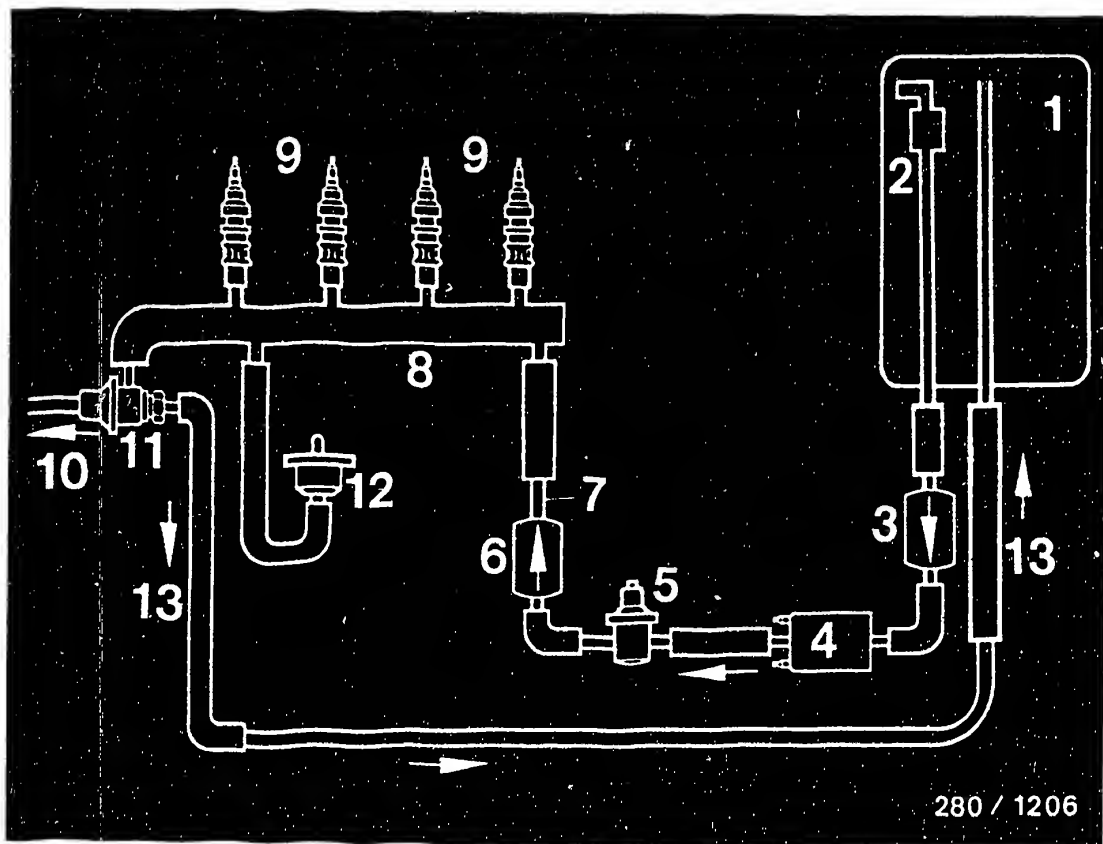


G14

Electrical terminal diagram

BMW

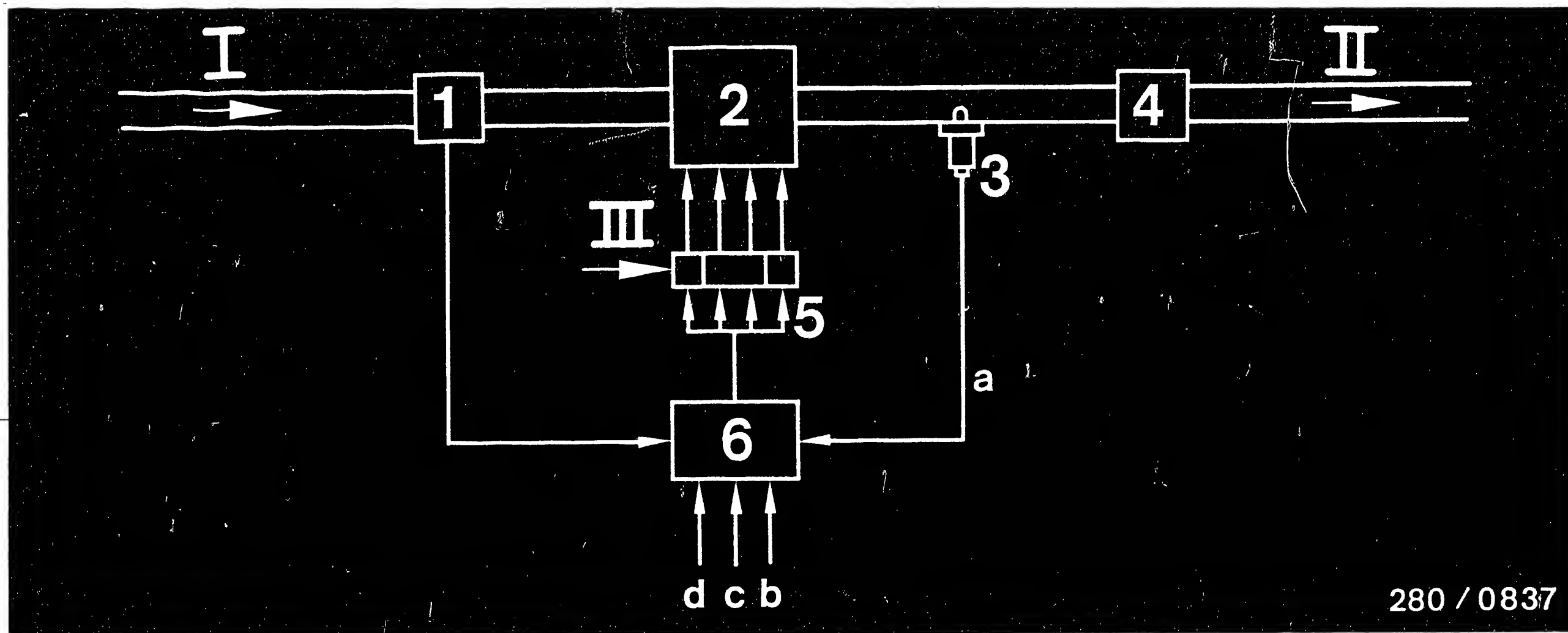




280 / 1206

FUEL LINE DIAGRAM

- 1 = Fuel tank
- 2 = In-tank pre-supply pump
- 3 = Fuel spinner
- 4 = Electric fuel pump
- 5 = Fuel-line-pressure damper
- 6 = Fuel filter
- 7 = Fuel-pressure line
- 8 = Fuel-distribution pipe
- 9 = Solenoid-operated injection valves
- 10 = Connection to intake manifold
- 11 = Pressure regulator
- 12 = Start valve
- 13 = Fuel return line



280 / 0837

1 = Air-flow sensor
2 = Engine
3 = Lambda sensor
4 = 3-way catalytic converter

5 = Solenoid-operated injection valves
6 = LU control unit with lambda closed-loop control
a = Sensor voltage
b = Supply voltage
c = Engine speed
d = Engine temperature

I = Air
II = Exhaust
III = Fuel

OPERATION OF LAMBDA CLOSED-LOOP CONTROL

By means of a feedback loop closed with the help of a special sensor - the lambda sensor -, deviations from a certain air-fuel ratio can be detected and corrected. The control principle rests on the fact that the residual oxygen content of the exhaust is continuously measured by the lambda sensor, this oxygen content being a measurement of the composition of the air-fuel mixture supplied to the engine. The lambda sensor in the exhaust pipe supplies information as to whether the mixture is richer or leaner than $\lambda = 1$. The lambda sensor informs the control unit of these deviations, and the lambda closed-loop control (in the control unit) influences the injection period or quantity pre-calculated by injection control. This closed-loop control to $\lambda = 1$ is required for the effective combustion of toxic substances in the down-line 3-way catalytic converter.

G 16

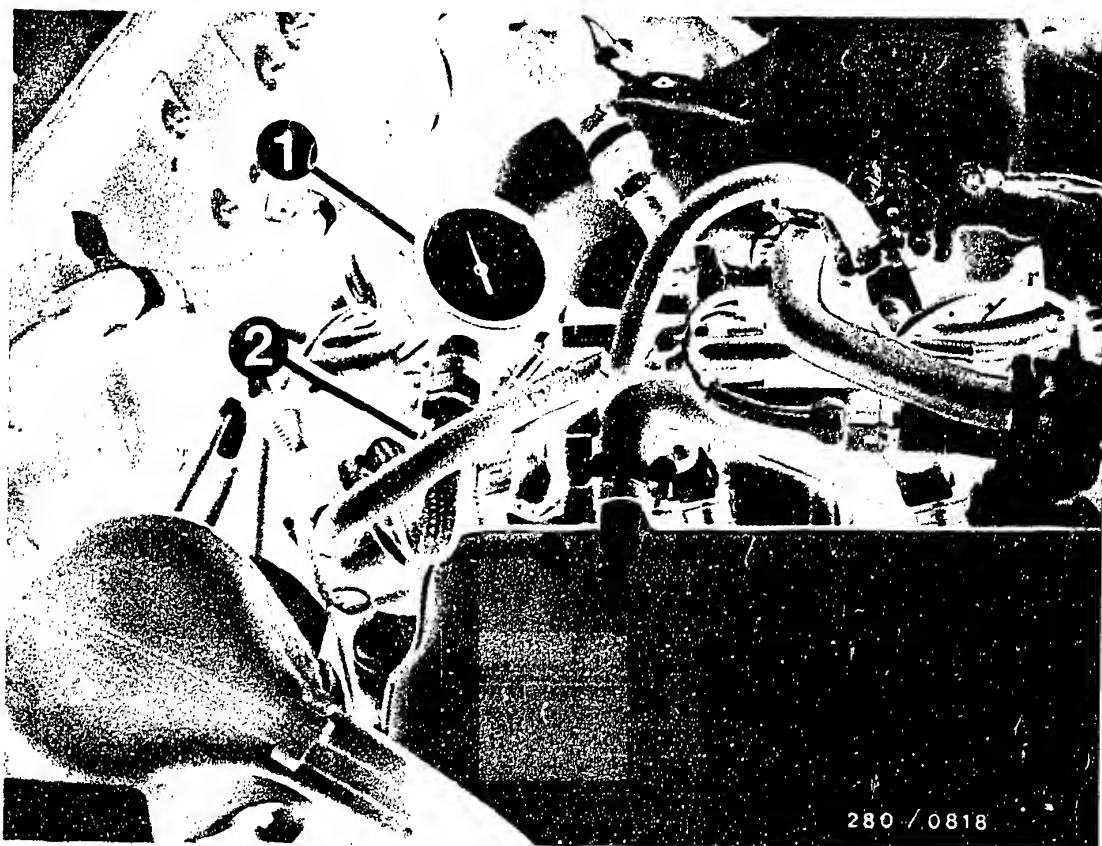
Lambda closed-loop control
BMW



G 17

Lambda closed-loop control
BMW





- 1 = Pressure gauge
2 = Pressure line to fuel-distribution pipe

Checking Fuel Pressure

Connect pressure gauge or pressure measuring device. Pull off pressure-line hose from fuel-distribution pipe. Connect pressure gauge. Make sure of tight sealing at connection. Careful! When unscrewing hose, make sure that no fuel gets on hot engine parts.

Problem vehicles (Bucking) (only those with 9.0:1 compression):

Prerequisite - system O.K.

1st remedial measure: exchange ignition distributor
...093 for ...043

Further remedial measure: exchange idle speed control for an auxiliary-air device 0 280 170 171.



INSTALLATION POSITION OF COMPONENTS

Installation position information is always in relation to direction of travel.

Control unit: (upper illustration)

The control unit is located in the passenger compartment on the passenger side, in the glove compartment behind a panel.

- 1 = Control unit
- 2 = Plug connection term. t_0
- 3 = Fastening screws for control unit covering panel

In order to connect universal test adapter, unplug control unit plug (25 pin). To do this, press detent in direction of arrow.

Electric fuel pump (middle illustration)

The electric fuel pump is located underneath the vehicle to the left in front of the left rear wheel.

- 1 = Fuel-line-pressure damper
- 2 = Electric fuel pump
- 3 = Fuel-pressure line
- 4 = Fuel spinner
- 5 = Fuel return line

Arrow = Direction of fuel flow

In-tank immersion sensor with in-tank pre-supply pump (lower illustration)

The installation position is in the passenger compartment to the right underneath the rear seat.

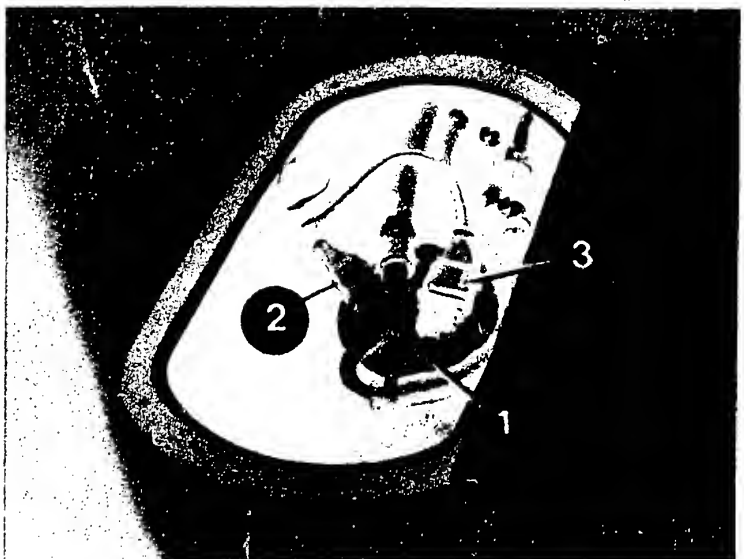
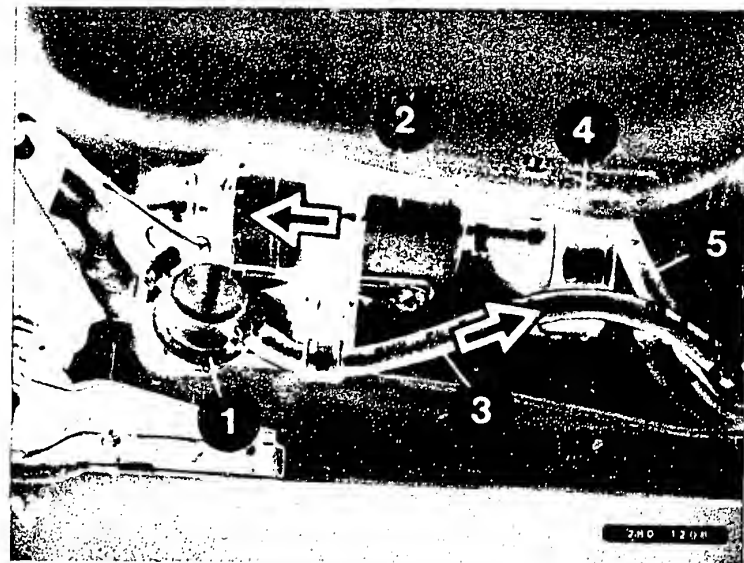
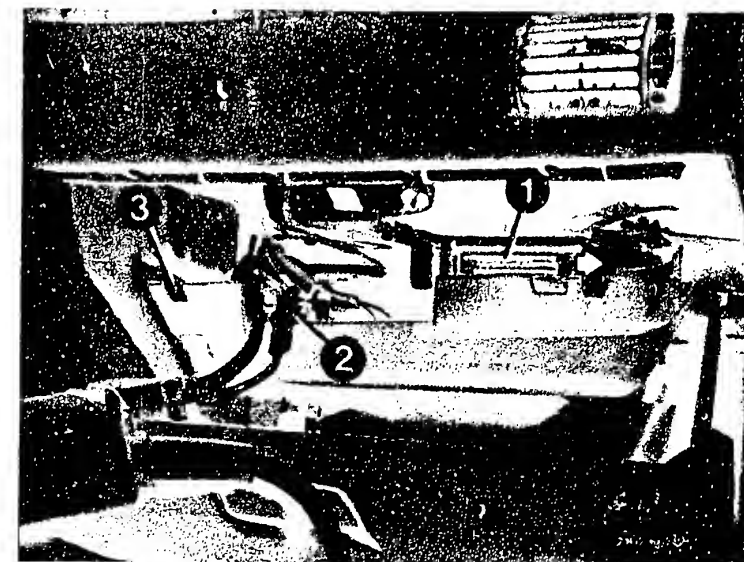
- 1 = Immersion sensor with in-tank pre-supply pump
- 2 = Pre-supply pump electrical connection
- 3 = Immersion sensor electrical connection

Checking immersion sensor

Measure resistance between term. G and term. 31 at float positions "empty" and "full"; the resistance curve (deflection) must show no interruption.

Empty = approx. 2.5...4.0 Ω

Full = approx. 56.5...61.0 Ω



G19

Installation position of components

BMW

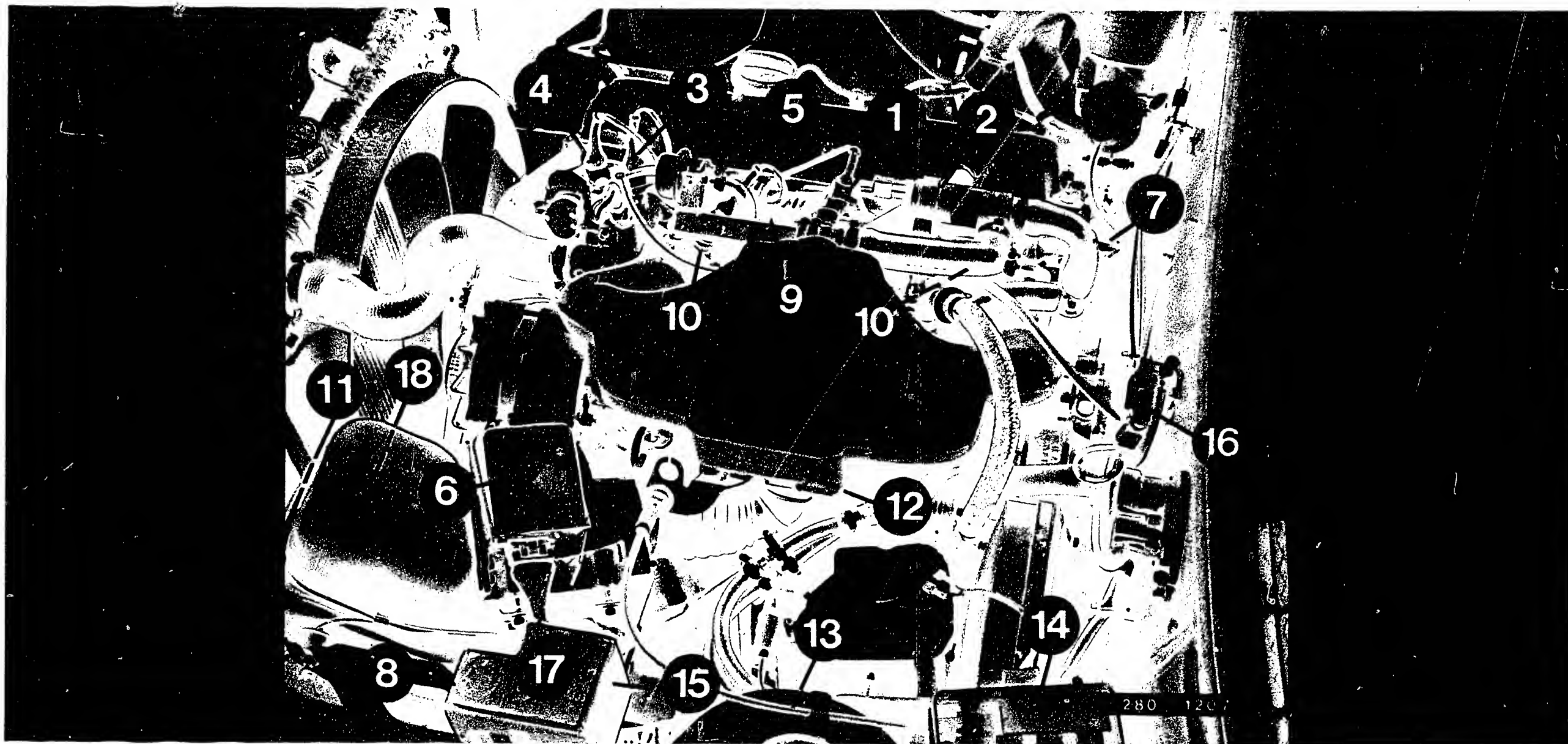


G20

Installation position of components

BMW





Installation Position of Components BMW 318i (Europe Catalytic converter) 1.85 only / BMW 318i US Version from 1.85

- | | | |
|--|---|--|
| 1 = Start valve | 7 = Fuel-line-pressure damper | 13 = Fuel filter |
| 2 = Idle actuator (non-Bosch product) | 8 = Control relay (underneath covering) | 14 = Pump fuse no. 11 |
| 3 = Temperature sensor II (white plug) | 9 = Ground terminal | 15 = Knock-protection relay |
| 4 = Thermo-time switch (brown plug) | 10 = Solenoid-operated injection valves | 16 = Solenoid-operated valve |
| 5 = Pressure regulator | 11 = Temperature sensor (intake air) | 17 = Relay for idle stabilization |
| 6 = Air-flow sensor | 12 = Throttle-valve switch | 18 = Pressure sensor (altitude sensor) |

G21

Installation position of components

BMW



G22

Installation position of components

BMW



Installation Position of Components (continued)

Upper illustration shows separating point for the lambda sensor and sensor heating (1).

Middle illustration shows diagnostic connector (view from above on engine block near thermo-time switch)

1 = Integrator connection

Lower illustration shows installation position of lambda sensor.

Note:

• Knock-protection relay

A protective circuit is integrated in the ignition timing control for high exterior temperatures together with high loads. This protective circuit influences or interrupts vacuum timing advance via a solenoid-operated valve.

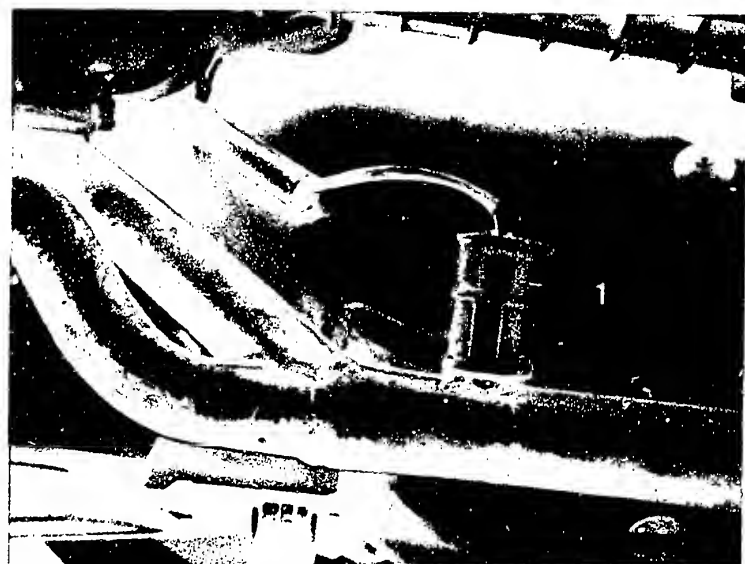
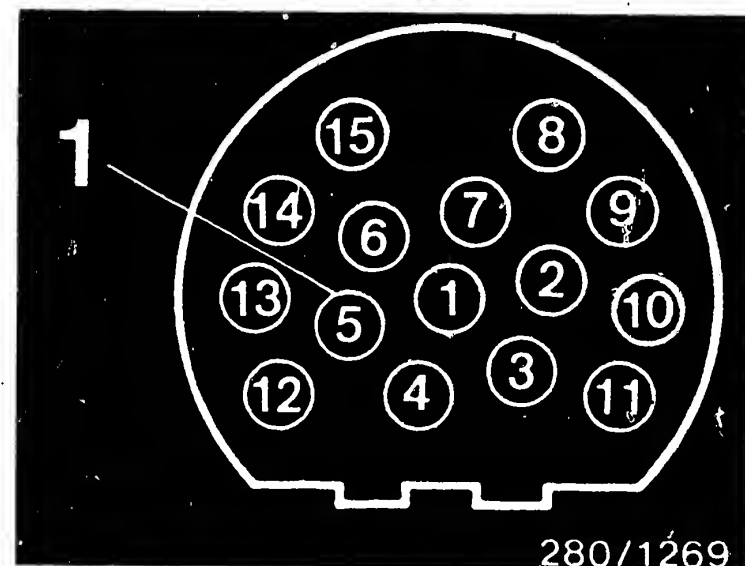
This protective circuit results in the following control possibilities:

1. Idle and run-up augmentation: at intake-air temperatures below $+10^{\circ}\text{C}$ and coolant temperatures below $+45^{\circ}\text{C}$, vacuum advance is operative.
2. Quick attainment of operating temperature for engine and catalytic converter; ignition timing retardation as a result of low coolant temperature (below $+45^{\circ}\text{C}$) and outside-air temperatures greater than $+10^{\circ}\text{C}$. Vacuum advance is not operative.
3. Prevention of overlapping of the ignition timing curve with the ping limit (operating temperature greater than $+45^{\circ}\text{C}$); at a loading corresponding to an ignition time of greater than 2.85 ms and an intake-air temperature greater than $+38^{\circ}\text{C}$, ignition timing advance is effected solely via centrifugal advance. The solenoid-operated valve has closed and intake manifold suction pressure becomes inoperative.

• Idle-speed control

The idle speed is stabilized by the electronic control unit (in glove compartment, near LU control unit) and the idle actuator. Instead of the usual auxiliary-air device, the idle actuator is built into the air bypass to the throttle valve.

From the control unit, the idle actuator tractive electromagnet receives a variable-pulsed voltage with constant frequency. With this the orifice in the air duct is widened or narrowed, changing the rate of air flow. The ACTUAL engine speed is derived from the term. t_0 pulses and compared with a SET engine speed in the control unit, and the idle actuator is correspondingly triggered.



G23

Installation position of components

BMW



G24

Installation position of components

BMW



T A B L E O F C O N T E N T S

Section

Coordinates

Special features/rapid diagnosis chart.....	H 2
Test specifications.....	H 7
Electrical terminal diagram from 2.85 to 8.85.....	H 9
Electrical terminal diagram from 9.85 to 11.85.....	H 11
Electrical wiring diagram from 2.85.....	H 13
Fuel line diagram.....	H 15
Lambda closed-loop control.....	H 16
Checking fuel pressure.....	H 18
Installation position of components.....	H 19
Notes.....	H 23



SPECIAL FEATURES

This microcard contains the LU-Jetronic trouble-shooting instructions for the following BMW model valid at press date: 318i EU with catalytic convertor from 2.85 to 11.85 l.8 l engine, 4 cyl. with 75 kW (102 hp)

- Compression 8.2 : 1
- Ignition distributor 0 237 002 096; for after-sales service, 0 237 003 043 possible until 3.85; from 4.85 0 237 002 11
- LU control unit 0 280 000 328
- O-ring connection of solenoid-operated injection valves and pressure regulator
- Fuel filter located in engine compartment
- Lambda closed-loop control
- Knock protection (non-Bosch product)
- Auxiliary-air device instead of low-idle-speed control
- In-tank pre-supply pump
- Heated lambda sensor
- t_p -release
- Engine speed limitation at 6400 min⁻¹

Remark

The LU-Jetronic in the BMW 318i catalytic convertor from 2.85 to 11.85 corresponds essentially to that of the BMW 318i EU/318 US.

- Similar SIS repair instructions:
SIS Microcard BMW 505

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER


The following rapid diagnosis chart provides the experienced L-Jetronic specialist with the ability to rapidly test the electrical components of the system using the universal test adapter.

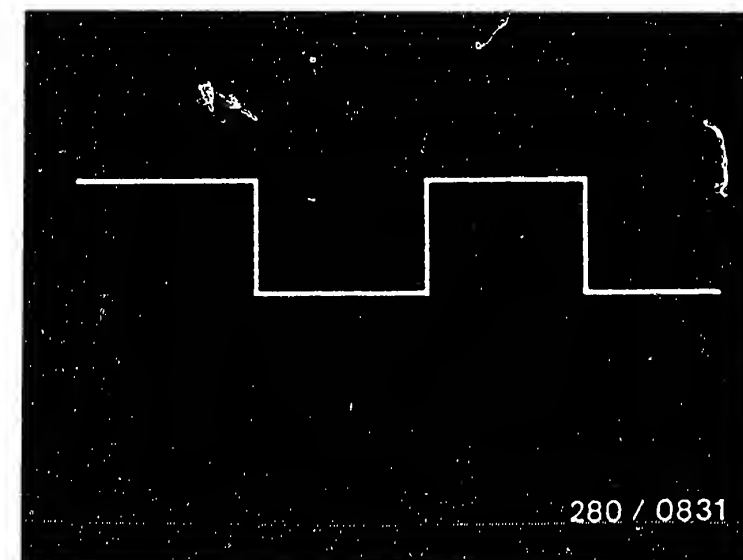
The rapid diagnosis chart contains the following information:

- Switch positions on universal test adapter
- Test step sequence
- Remarks on operation of universal test adapter or other components.
- Readings on multimeter



Rapid Diagnosis Chart for Universal Test Adapter

Test Step	Switch Position		Remarks	Test Specifications (Reading)
	V	Ω		
1	5	-	Disengage gear and start. t _D signal at ignition trigger box term. no. 16. At control unit plug term. 1 to term. 5	See upper figure
2	6	-	Disengage gear and start. Voltage from control relay term. 17 at control unit plug term. 9 to term. 5	<u>8 ... 15 V</u>
3	7	-	Disengage gear and start. Voltage from starting motor term. 50 at control unit plug term. 4 to term. 5	<u>8 ... 15 V</u>
4		11	Resistance of temperature sensor NTC I at control unit plug term. 8 to term. 5	<u>100 ... 200 Ω</u>



H3

Rapid Diagnosis Chart

BMW









H4

Rapid Diagnosis Chart

BMW



Rapid Diagnosis Chart for Universal Test Adapter (continued)

Test Step	Switch Position		Measurement	Remarks	Test Specifications (Reading)
	V	Ω			
5		12	Resistance of air-flow sensor potentiometer at control unit plug term. 7 to term. 5	Deflect sensor plate to stop.	<u>60 ... 1000 Ω</u>
6		13	Resistance of temperature sensor NTC II (engine temperature) at control unit plug term. 10 to term. 5	---	(+15°C...+30°C): <u>1.3 ... 3.6 kΩ</u> + 80°C: <u>250 ... 390 Ω</u>
7		14	Resistance ground output stage at control unit plug term. 13 to term. 5	---	<u>0 ... 10 Ω</u>
8		16	Resistance of idle contact in throttle-valve switch, at control unit plug term. 2 to term. 9	Accelerator pedal in rest position	<u>0 ... 10 Ω</u>
9		17	Resistance of full-load contact in throttle-valve switch at control unit plug term. 3 to term. 9	Accelerator pedal fully depressed (full-load position)	<u>0 ... 10 Ω</u>
10		18	Resistance of all 4 parallel-connected solenoid-operated injection valves at control unit plug term. 12 to term. 9	---	(+15°C...+30°C): <u>7.0 ... 9.5 Ω</u> approx. +80°C: <u>7.2 ... 10.0 Ω</u>

H5

Rapid Diagnosis Chart

BMW


H6

Rapid Diagnosis Chart

BMW



TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure 2.8...3.2 bar

Electric fuel pump

- Delivery quantity (measured in return): min. min. 650cm³/30sec
- Terminal voltage (under load): min. 12 V
- In-tank pre-supply pump min. 700cm³/30s

Thermo-time switch (35°/8s):

● Electrical internal resistance at	Between term. "G" and ground	Between term. "W" and ground	Between term. "G" and "W"
Ambient temperature (below +30°C)	25...40 Ω	0Ω	25...40Ω
Operating temperature (above +40°C)	50...80 Ω	100...160Ω	50...80 Ω

Start valve

- Electrical internal resistance: 3.5...4.5 Ω
- Leakage: maximum permissible 1 drop/min.

Auxiliary-air device

- Electrical internal resistance: 30 ... 65 Ω

Temperature sensor II (engine)

- Electrical internal resistance at
Ambient temperature (+15°C...+30°C): 1.3...3.6 kΩ
Operating temperature (approx +80°C): 250...390 Ω

Solenoid-operated injection valve (at +20°C)

- Electrical internal resistance: 14.5...17.0 Ω

Lambda-sensor heating

- Electrical internal resistance (PTC): 1.00...15.0 Ω



Air-flow sensor

- Resistance value between
Term. 8 and term. 5: 340...450 Ω
Term. 7 and term. 5 (fully deflect
sensor flap) 60...1000 Ω
Term. 9 and term. 5: 500...760 Ω
Term. 8 and term. 9: 160...300 Ω

Idle-speed adjustment (engine at op. temp., approx.
+80°C)

Manual trans. Ignition distributor 800...900 min⁻¹
Automatic trans. 0 237 002 111 850...950 min⁻¹

Manual trans. Ignition distributor 800...900 min⁻¹
Automatic • 0 237 003 043 700...800 min⁻¹
trans.

- CO adjustment via lambda
closed-loop control Voltage reading
operation (sensor fluctuates be-
connected) integrator tween 2 values
output diagnosis socket
no. 5:

Open-loop operation Voltage reading
(sensor lead separated): must equal
fluctuating mean
value.

Lambda closed-loop control

- Rich value (separate sensor lead
and connect to ground on control
unit side): 9 ... 11 V
- Lean value (apply 2 V to sensor
lead on control unit side): approx. 0.5 V

Switch off suction plant for period of exhaust
measurement and adjusting. Observe safety precautions.

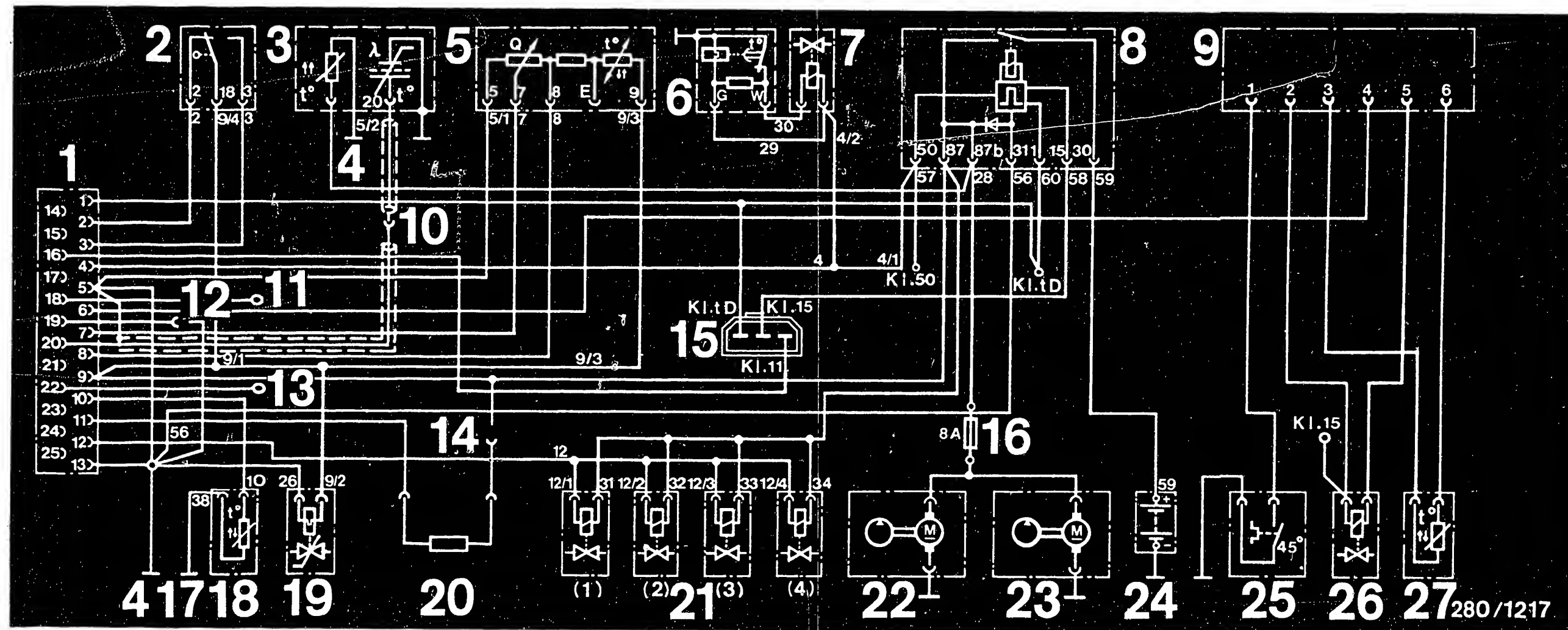
For setting values for ignition, valve play, and other
technical engine data, see equipment and Autodata
microcard.

H8

Test Specifications

BMW





Electrical Terminal Diagram BMW 318i EU Catalytic Converter from 2.85 to 8.85

- | | | | |
|--|---|--|--|
| 1 = Control unit plug | 10 = Lambda sensor plug connection | 14 = In catalyst operation, plug connection <u>not</u> plugged | 20 = Full-load leaning 120 kΩ |
| 2 = Throttle-valve switch | 11 = To N.O. relay term. 87, only with air conditioner | 15 = Connection for injection and on-board computer | 21 = Solenoid-operated injection valves |
| 3 = Heated lambda sensor (common 3-pin plug) | 12 = Data encoding <u>open</u> . Connected = 1 % leaner | 16 = Pump fuse | 22 = Electric fuel pump |
| 4 = Output stage ground terminal | 13 = Integrator output diagnosis socket pin 5 | 17 = Electronics ground terminal | 23 = In-tank pre-supply pump |
| 5 = Air-flow sensor | | 18 = Temperature sensor | 24 = Battery |
| 6 = Thermo-time switch | | 19 = Auxiliary-air device | 25 = Temperature switch +45°C |
| 7 = Start valve | | | 26 = Solenoid-operated change-over valve |
| 8 = Control relay | | | 27 = Intake-air temperature sensor |
| 9 = Knock-protection relay | | | |

H9

Electrical Terminal Diagram

BMW

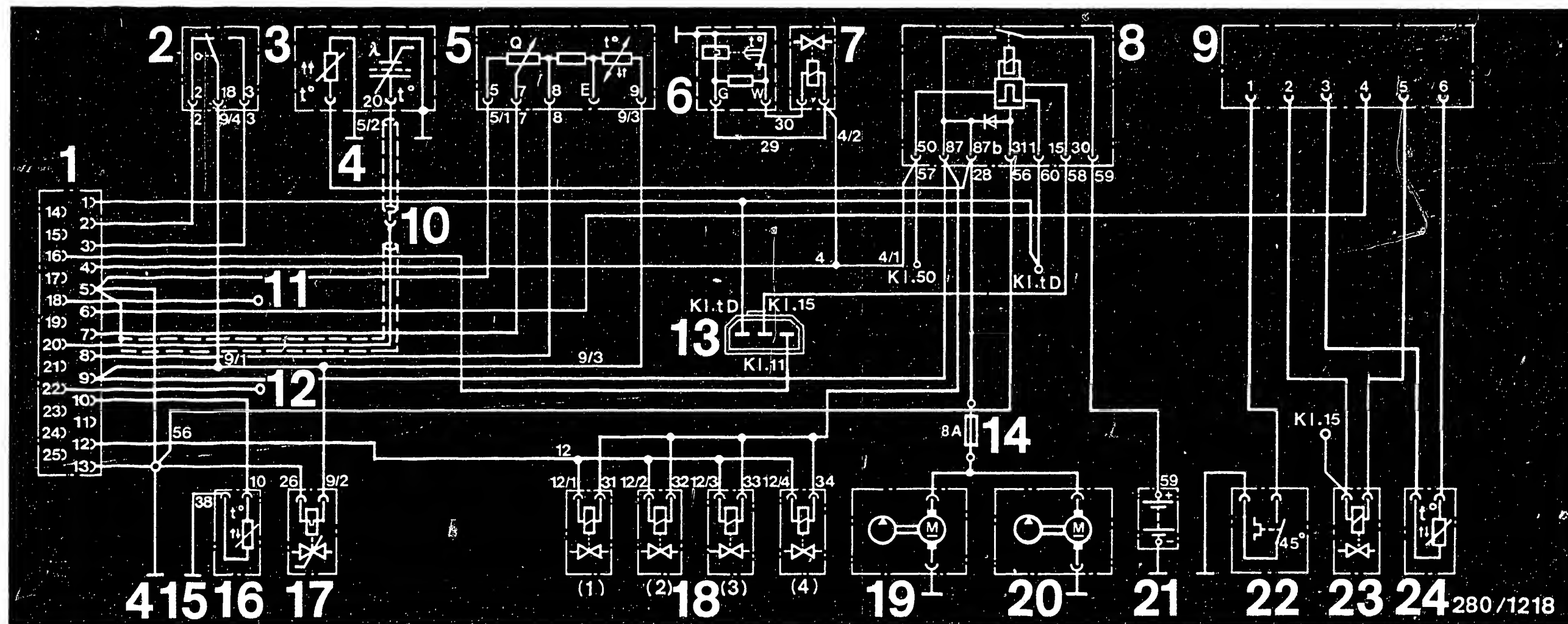


H10

Electrical Terminal Diagram

BMW





Electrical Terminal Diagram BMW 318i EU Catalytic Converter from 9.85 to 11.85

- | | | |
|--|--|--|
| 1 = Control unit plug | 11 = To N.O. relay term. 87 only with air conditioning | 18 = Solenoid-operated injection valves |
| 2 = Throttle-valve switch | 12 = Integrator output diagnosis socket pin 5 | 19 = Electric fuel pump |
| 3 = Heated lambda sensor (common 3-pin plug) | 13 = Connection for injection and on-board computer | 20 = In-tank pre-supply pump |
| 4 = Output stage ground terminal | 14 = Pump fuse | 21 = Battery |
| 5 = Air-flow sensor | 15 = Electronics ground terminal | 22 = Temperature switch +40°C |
| 6 = Thermo-time switch | 16 = Temperature sensor II | 23 = Solenoid-operated switch-over valve |
| 7 = Start valve | 17 = Auxiliary-air device | 24 = Intake-air temperature sensor |
| 8 = Control relay | | |
| 9 = Knock-protection relay | | |
| 10 = Lambda-sensor plug connection | | |

H11

Electrical Terminal Diagram

BMW

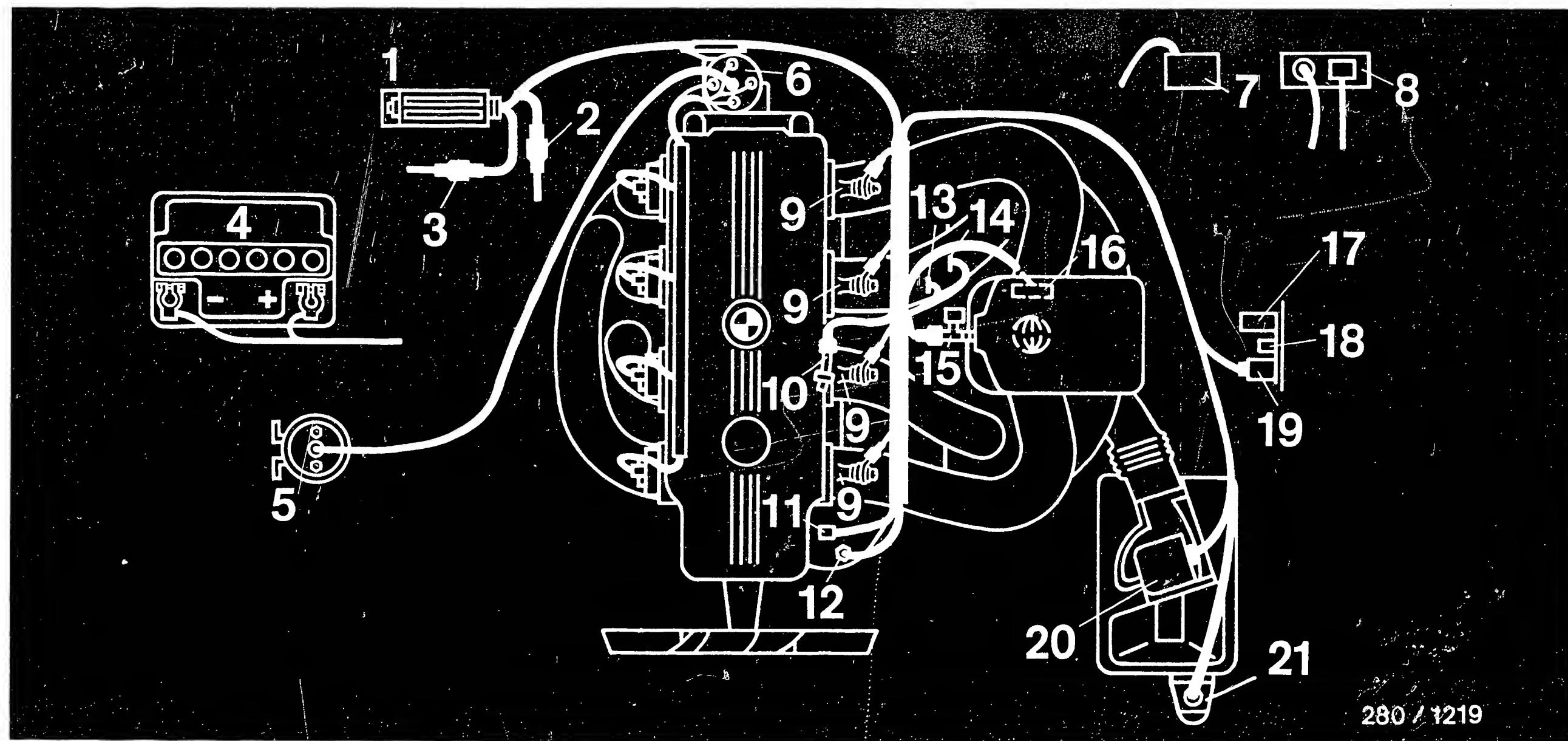


H12

Electrical Terminal Diagram

BMW





280 / 1219

ELECTRICAL WIRING DIAGRAM BMW 318i EU CATALYTIC CONVERTER FROM 2.85 to 11.85

- | | | | |
|---|--|-----------------------------------|------------------------------------|
| 1 = Control unit plug | 6 = Ignition distributor | 12 = Thermo-time switch | 18 = N.O. relay |
| 2 = Lambda sensor disconnection point | 7 = Solenoid-operated valve | 13 = Electronics ground terminal | 19 = Control relay |
| 3 = Plug connection for term. t _D , term. 15, term. 11 | 8 = Spark-advance unit | 14 = Output stage ground terminal | 20 = Air-flow sensor |
| 4 = Battery | 9 = Solenoid-operated injection valves | 15 = Start valve | 21 = Intake-air temperature sensor |
| 5 = Ignition coil | 10 = Auxiliary-air device | 16 = Throttle-valve switch | |
| | 11 = Temperature sensor II | 17 = Knock-protection relay | |

H13

Electrical Wiring Diagram

BMW

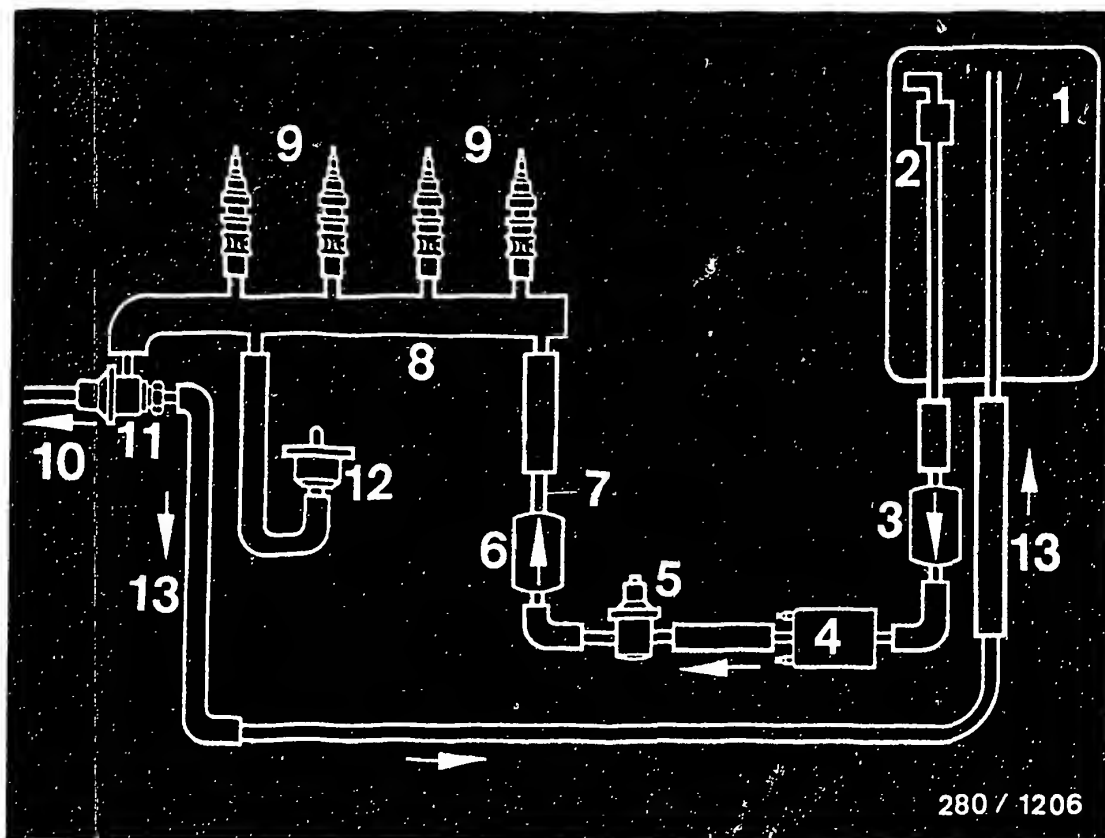


H14

Electrical Wiring Diagram

BMW

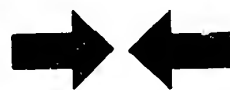


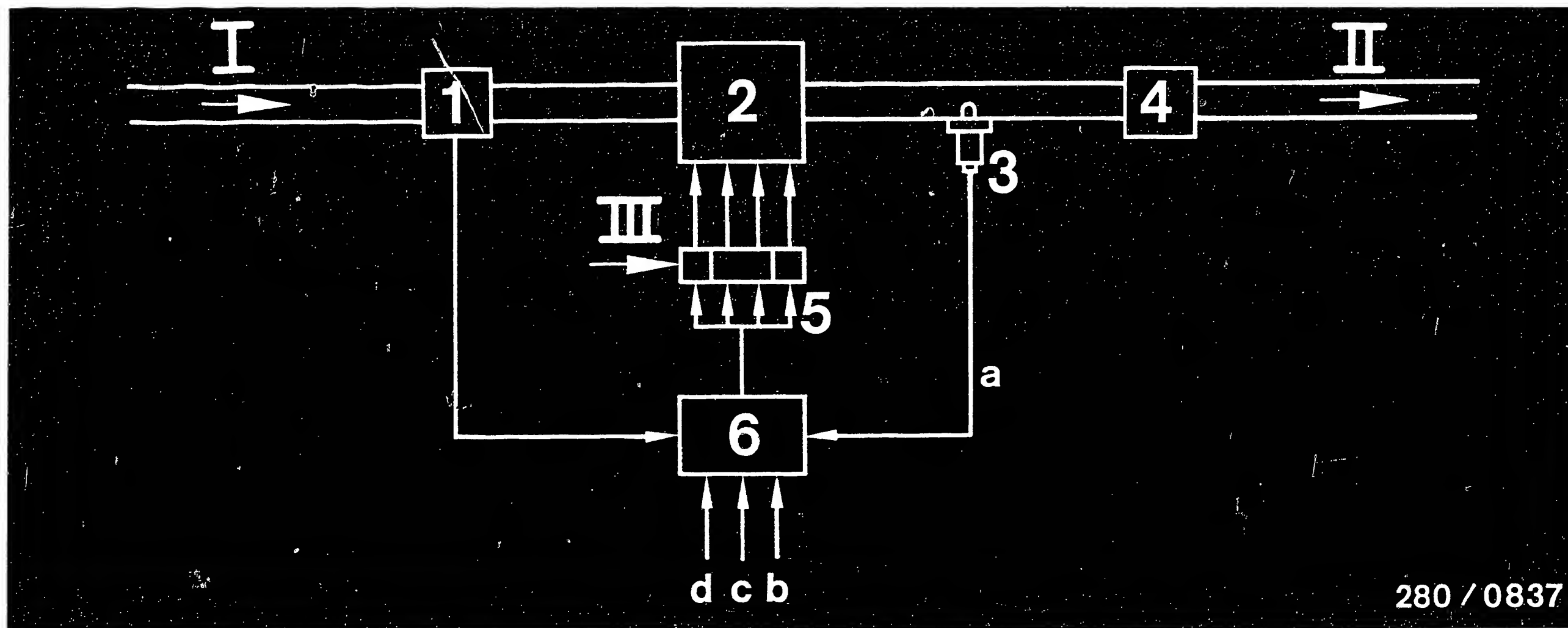


280 / 1206

FUEL LINE DIAGRAM

- 1 = Fuel tank
- 2 = In-tank pre-supply pump
- 3 = Fuel spinner
- 4 = Electric fuel pump
- 5 = Fuel-line-pressure damper
- 6 = Fuel filter
- 7 = Fuel-pressure line
- 8 = Fuel-distribution pipe
- 9 = Solenoid-operated injection valves
- 10 = Connection to intake manifold
- 11 = Pressure regulator
- 12 = Start valve
- 13 = Fuel return line





280 / 0837

1 = Air-flow sensor
2 = Engine
3 = Lambda sensor
4 = 3-way catalytic converter

5 = Solenoid-operated
injection valves
6 = LU control unit with
lambda closed-loop control

a = Sensor voltage
b = Supply voltage
c = Engine speed
d = Engine temperature

I = Air
II = Exhaust
III = Fuel

OPERATION OF LAMBDA CLOSED-LOOP CONTROL

By means of a feedback loop closed with the help of a special sensor - the lambda sensor - , deviations from a certain air-fuel ratio can be detected and corrected. The control principle rests on the fact that the remaining oxygen content of the exhaust is continuously measured by the lambda sensor, this oxygen content being a measurement of the composition of the air-fuel mixture supplied to the engine. The lambda sensor in the exhaust pipe supplies information as to whether the mixture is richer or leaner than $\lambda = 1$. The lambda sensor informs the control unit of these deviations, and the lambda closed-loop control (in the control unit) influences the injection period or quantity pre-calculated by injection control. This closed-loop control to $\lambda = 1$ is required for the effective combustion of toxic substances in the down-line 3-way catalytic converter.

H16

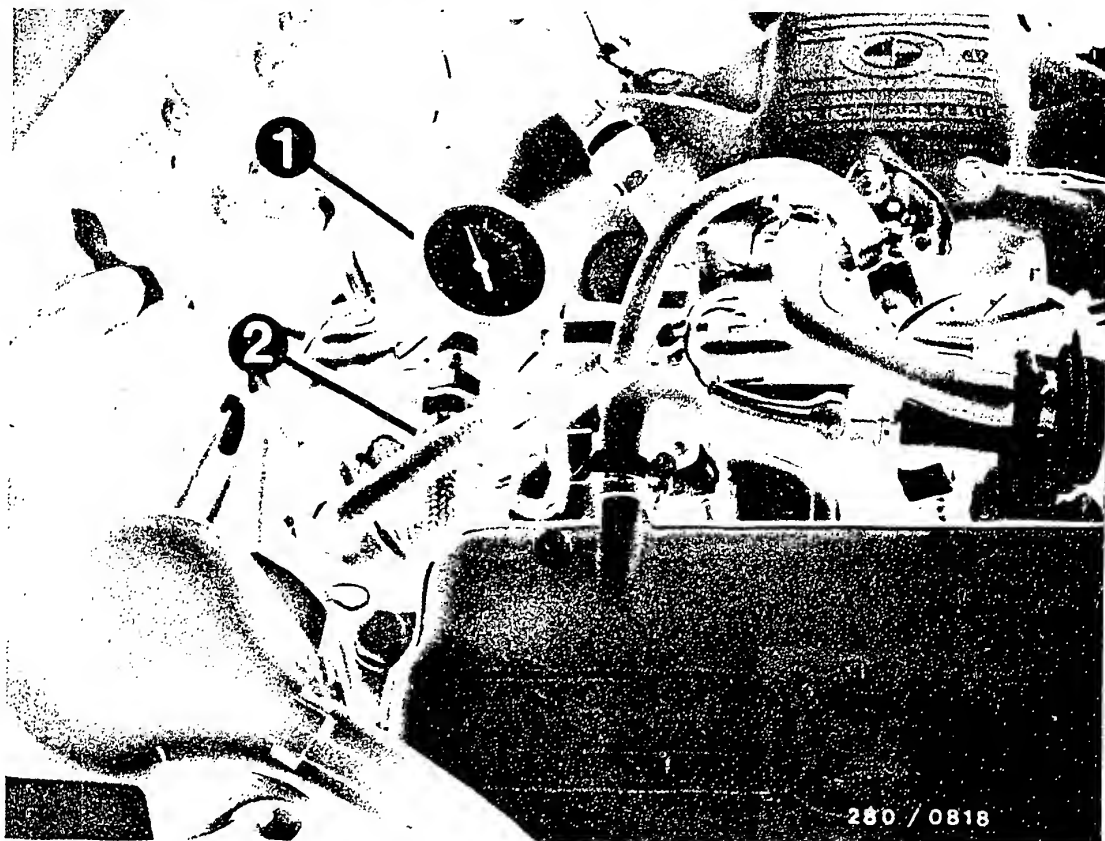
Lambda Closed-Loop Control
BMW



H17

Lambda Closed-Loop Control
BMW





- 1 = Pressure gauge
2 = Pressure line to fuel-distribution pipe

Checking Fuel Pressure

Connect pressure gauge or pressure measuring device. Pull off pressure-line hose from fuel-distribution pipe. Connect pressure gauge. Make sure of tight sealing at connection.

Note: When unscrewing hose, make sure that no fuel gets on hot engine parts.



INSTALLATION POSITION OF COMPONENTS

Installation position information is always in relation to direction of travel

Control unit: (upper illustration)

The control unit is located in the passenger compartment on the passenger side, in the glove compartment behind a panel.

- 1 = Control unit
- 2 = Plug connection term. tp
- 3 = Fastening screws for control unit covering panel

In order to connect universal test adapter, unplug control unit plug (25 pin). To do this, press detent in direction of arrow.

Electric fuel pump (middle illustration)

The electric fuel pump is located underneath the vehicle to the left in front of the left rear wheel.

- 1 = Fuel-line-pressure damper
 - 2 = Electric fuel pump
 - 3 = Fuel pressure line
 - 4 = Fuel spinner
 - 5 = Fuel return line
- Arrow = Direction of fuel flow

In-tank immersion sensor with in-tank pre-supply pump (lower illustration)

The installation position is in the passenger compartment to the right underneath the rear seat.

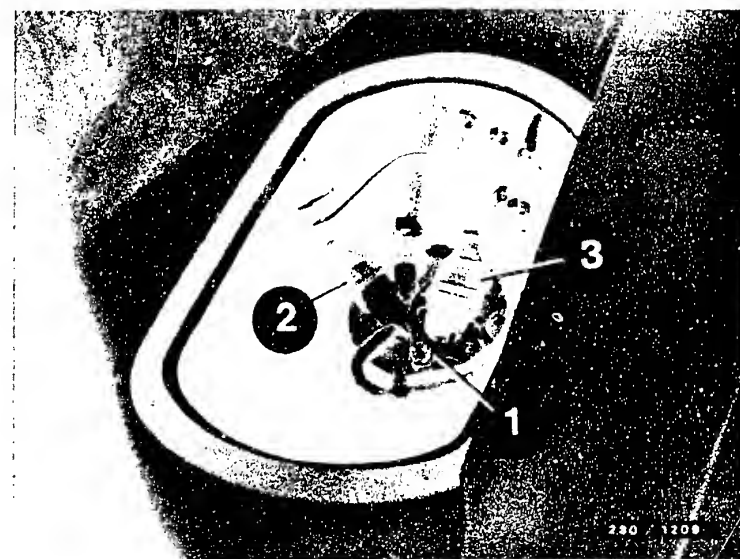
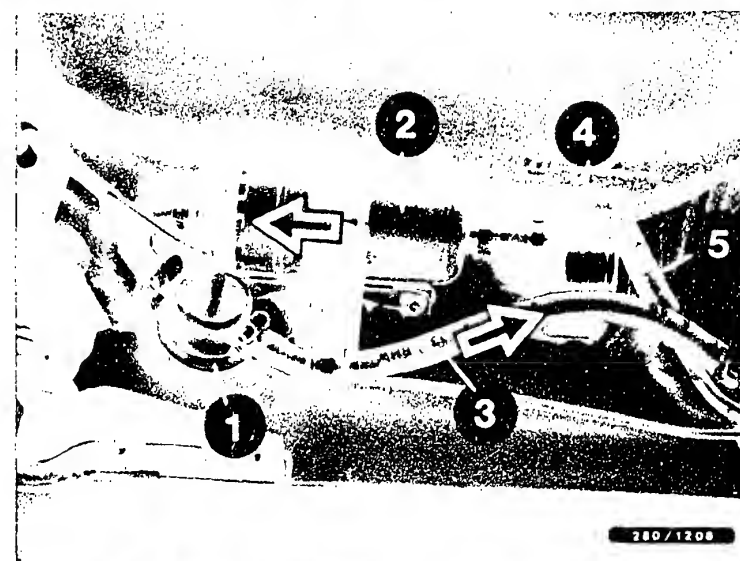
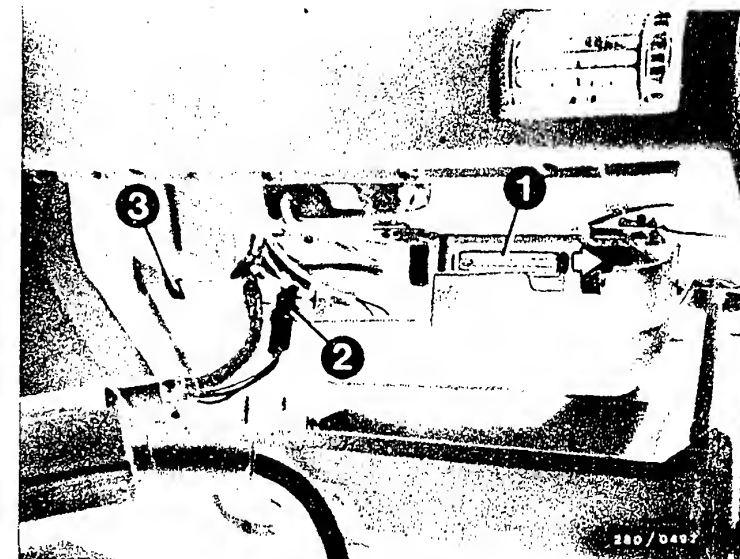
- 1 = Immersion sensor with in-tank pre-supply pump
- 2 = Pre-supply pump electrical connection
- 3 = Immersion sensor electrical connection

Checking immersion sensor

Measure resistance between term. G and term. 31 at float positions "empty" and "full"; the resistance curve (deflection) must show no interruption.

Empty = approx. 2.5 ... 4.0 Ω

Full = approx. 56.5 ... 61.0 Ω



H19

Installation Position of Components

BMW

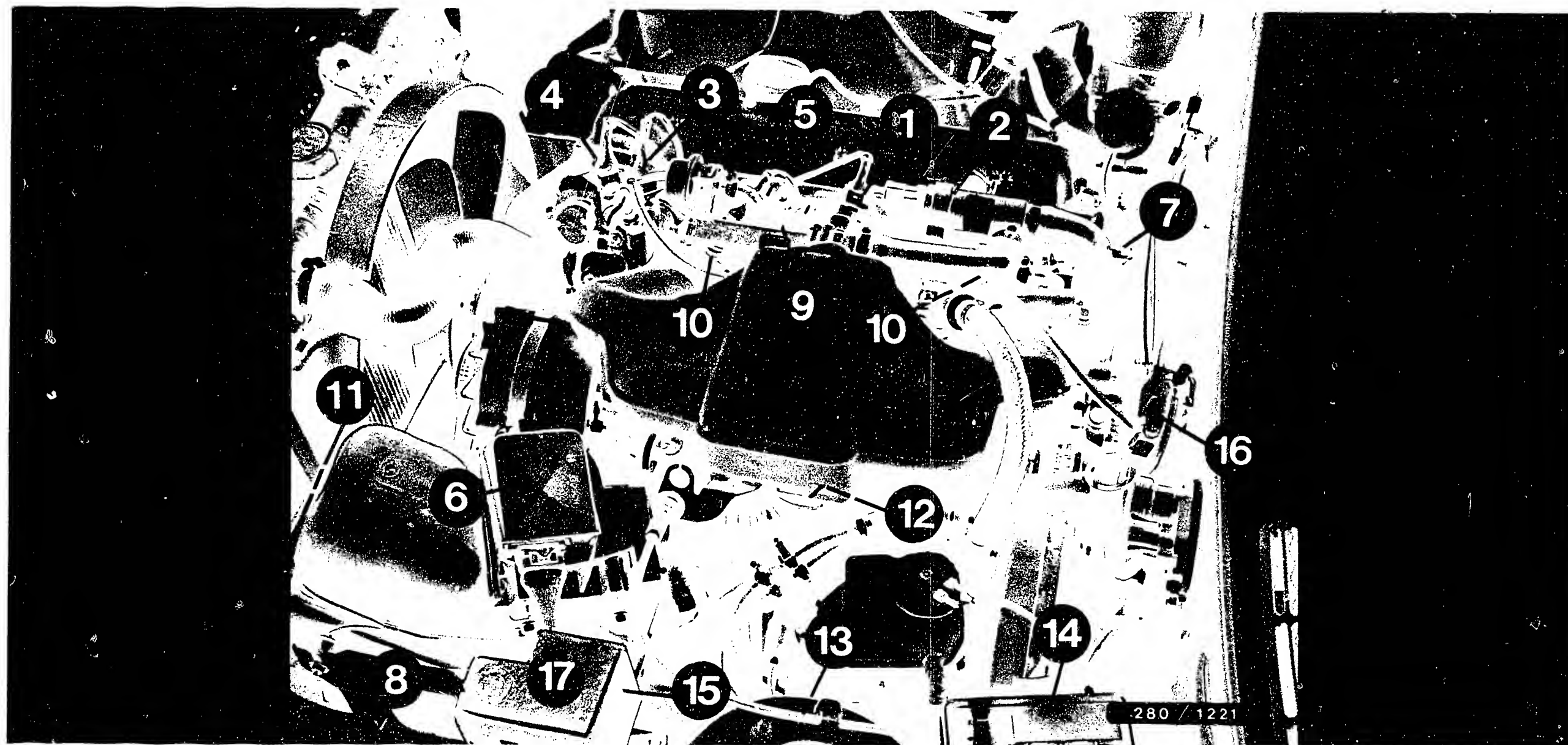


H20

Installation Position of Components

BMW





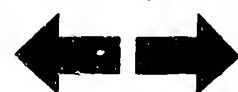
Installation Position of Components (continued) BMW 318i (Europe Catalytic Converter) from 2.85 to 11.85

- | | | |
|--|--|------------------------------|
| 1 = Start valve | 7 = Fuel-line-pressure damper until 8.85 | 13 = Fuel filter |
| 2 = Idle actuator (non-Bosch product) | 8 = Control relay (underneath covering) | 14 = Pump fuse no. 11 |
| 3 = Temperature sensor II (white plug) | 9 = Ground terminal | 15 = Knock-protection relay |
| 4 = Thermo-time switch (brown plug) | 10 = Solenoid-operated injection valves | 16 = Solenoid-operated valve |
| 5 = Pressure regulator | 11 = Temperature sensor (intake air) | 17 = N.O. relay |
| 6 = Air-flow sensor | 12 = Throttle-valve switch | |

H21

Installation Position of Components

BMW



H22

Installation Position of Components

BMW



Installation Position of Components (continued)

Upper illustration shows separating point for the lambda sensor and sensor heating (1).

Middle illustration shows diagnostic connector (view from above on engine block forward near thermo-time switch)

1 = Integrator connection

Lower illustration shows installation position of Lambda sensor.

Note:

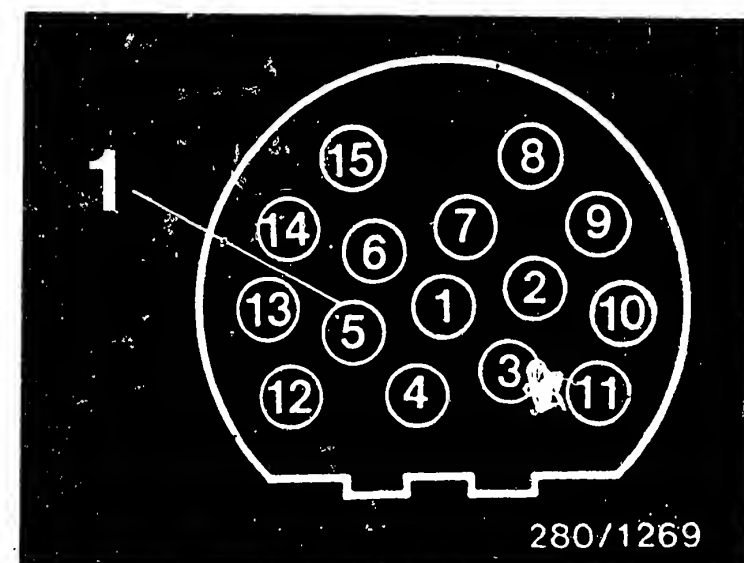
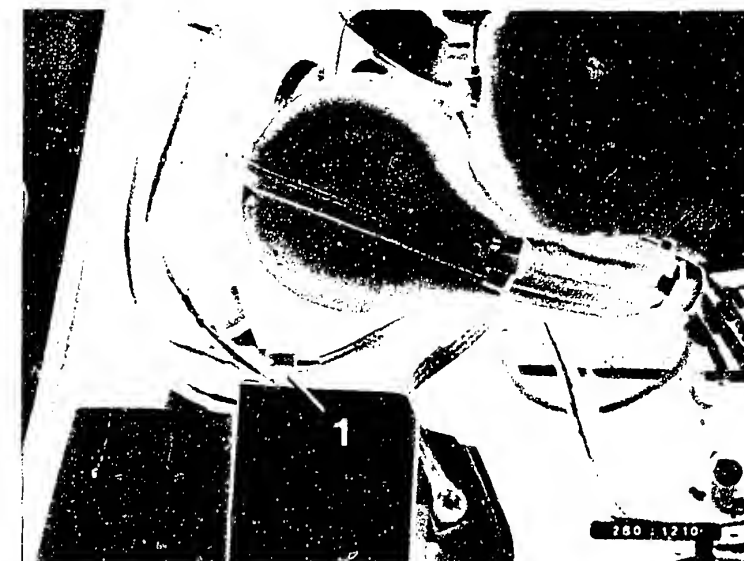
● Knock-protection relay

A protective circuit is integrated in the ignition timing control for high exterior temperatures together with high loads. This protective circuit influences or interrupts vacuum timing advance via a solenoid-operated valve.

This protective circuit results in the following control possibilities:

1. Idle and run-up augmentation: at intake-air temperatures below $+10^{\circ}\text{C}$ and coolant temperatures below $+45^{\circ}\text{C}$, vacuum advance is operative.
2. Quick attainment of operating temperature for engine and catalytic converter; ignition timing retardation as a result of low coolant temperature (below $+45^{\circ}\text{C}$) and outside-air temperatures greater than $+10^{\circ}\text{C}$. Vacuum advance is not operative.
3. Prevention of overlapping of the ignition timing curve with the ping limit (operating temperature greater than $+45^{\circ}\text{C}$); at a loading corresponding to an ignition time of greater than 2.85 ms and an intake-air temperature greater than $+38^{\circ}\text{C}$, ignition timing advance is effected solely via centrifugal advance. The solenoid-operated valve has closed and intake manifold suction pressure becomes inoperative.

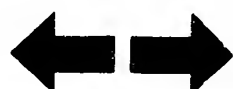
- N.O. relay: Suppresses overrun cut-off when air conditioner is on.



H23

Installation Position of Components

BMW



H24

Installation Position of Components

BMW



T A B L E O F C O N T E N T S

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Electrical terminal diagram (knock protection and idle-speed control).....	J 11
Electrical terminal diagram 2.85 to 8.85....	J 13
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Fuel pressure test.....	J 20
Installation position of components	J 21



SPECIAL FEATURES:

This microcard contains the LU-Jetronic trouble-shooting instructions for the following BMW models valid at the time of printing:

- 318i EU cat-prepared 1.85
 - Ignition distributor No. 0 237 002 096
 - Idle-speed control (non-Bosch product)
 - Pressure sensor (altitude sensor)
- 318i EU cat-prepared from 2.85 to 8.85
 - Ignition distributor No. 0 237 002 096 from 4.85
 - ignition distributor No. 0 237 002 111
 - Auxiliary-air device
 - Full-load leaning 120 k Ω (in lead term. 11 in handle cover of LE control-unit plug) up to 8.85
- 318i EU cat-prepared from 9.85 to 11.85
 - Ignition distributor No. 0 237 002 111
 - Auxiliary-air device
 - Voltage divider

Special features (all vehicles)

- 1.8l engine 4-cylinder with 75 kW (102 HP-DIN) LE control unit 0 280 000 328
- Knock protection (non-Bosch product), in-tank pre-supply pump, fuel filter in engine compartment, engine-speed limitation at 6400 min⁻¹

Basic microcard for detailed trouble-shooting:

BMW 505

Important: If referring to a basic microcard, remember that the test specifications must be taken always from the vehicle-related brief instructions.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system with the universal test adapter.

The rapid diagnosis chart contains the following information:

- Switch positions on universal test adapter
- Sequence of test steps
- Notes on how to operate the universal test adapter or other components
- Test specifications for multimeter and motortester.

J2

Special features/Rapid diagnosis chart
BMW



Rapid diagnosis chart for universal test adapter

Test step	Switch position		Remarks	Test specifications (reading)
	V	Ω		
1	5	-	Shift gear to neutral and start. t_D signal, at ignition trigger box On control-unit plug term. 1 to term. 5	See top diagram
2	6	-	Shift gear to neutral and start. Voltage from control relay term. 87. On control-unit plug term. 9 to term. 5.	8 ... 15 V
3	7	-	Shift gear to neutral and start. Voltage from starting motor term. 50. On control-unit plug term. 4 to term. 5.	8 ... 15 V
4	8	-	1/85 date of manufacture: shift gear to neutral and start. Voltage from pressure sensor. On control-unit plug term. 11 to term. 5.	Altitude-dependent 300 m altitude: 2 ... 4 V 4000 m altitude: 8 ... 12 V
			From 2.85 - 8.85 this test step is not applicable From 9.85 to 11.85 Shift gear to neutral and start. Voltage from voltage divider. On control-unit plug term. 11 to term. 5	5.5... 7.5 V
5	↓	11	Resistance of temperature sensor NTC I on control-unit plug term. 8 to term. 5	100...200 Ω



t_D signal

J3

Rapid diagn. chart for univ. test adapt.
BMW



J4

Rapid diagn. chart for univ. test adapt.
BMW

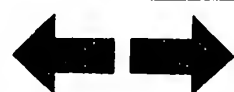


Rapid diagnosis chart for universal test adapter (continued)

<u>Test step</u>	<u>Switch position</u>	<u>Measurement</u>	<u>Remarks</u>	<u>Test specifications (reading)</u>
6	↓	12 Resistance of air-flow sensor potentiometer. On control-unit plug term. 7 to term. 5	Deflect sensor flap as far as it will go.	<u>60 ... 1000 Ω</u>
7	↓	13 Resistance of temperature sensor NTC II (engine temperature) on control-unit plug term. 10 to term. 5	---	(+15°C...+30°C): <u>1.3...3.6 kΩ</u> +80°C: <u>250...390 Ω</u>
8	↓	14 Resistance of output stage ground. On control-unit plug term. 13 to term. 5.	---	<u>0 ... 10 Ω</u>
9	↓	16 Resistance of idle contact in throttle-valve switch. On control-unit plug term. 2 to term. 9.	Accelerator in rest position Accelerator slightly depressed	<u>0 ... 10 Ω</u> <u>∞Ω</u>
10	↓	17 Resistance of full-load contact in throttle-valve switch. On control-unit plug term. 3 to term. 9.	Accelerator in rest position Accelerator in full-load position	<u>∞Ω</u> <u>0 ... 10 Ω</u>
11	↓	18 Resistance of all 4 parallel-connected solenoid-operated injection valves. On control-unit plug term. 12 to term. 9	---	(+15°C...+30°C): <u>7.0...9.5 Ω</u> approx. +80°C: <u>7.2...10.0 Ω</u>

J5

Rapid diagn. chart for univ. test adapt.
BMW



J6

Rapid diagn. chart for univ. test adapt.
BMW



TEST SPECIFICATIONS

Pressure regulator

- Fuel pressure 2.8...3.2 bar

Electric fuel pump

- Delivery (measured in return): min. 650cm³/30s
- Terminal voltage (under load): min. 12 V
- In-tank pre-supply pump: min. 700cm³/30s

Thermo-time switch (35°/8s):

● Electrical internal resistance at	Between term. "G" + ground	Between term. "W" + ground	Between term. "G" + "W"
Ambient temperature (below +30°C)	25...40Ω	0 Ω	25...40Ω
with engine at normal op. temp. (above +40°C)	50...80Ω	100...160Ω	50...80 Ω

Start valve

- Electrical internal resistance: 3.5...4.5 Ω
- Leaks: max. allowable 1 drop/min.

Idle actuator (1.85)

- Electrical internal resistance at ambient temperature (+15°C...+30°C) 9 ... 10 Ω

Auxiliary-air device as of 2.85

- Electrical internal resistance: 20...55Ω

Temperature sensor II (engine)

- Electrical internal resistance at ambient temperature (+15°...+30°C): 1.3...3.6 kΩ
- engine at op. temp. (ca. +80°C): 250...390 Ω

Solenoid-operated injection valve (at + 20°C)

- Electrical internal resistance 15.0...17.5 Ω



Air-flow sensor

- Resistance between

Term. 8 and term. 5:	340...450 Ω
Term. 7 and term. 5: (sensor flap fully deflected)	60...1000 Ω
Term. 9 and term. 5:	500...760 Ω
Term. 8 and term. 9:	160...300 Ω

Pressure sensor (altitude sensor) 1.85

300 m altitude (977 mbar):	2.0...4.0 V
4000m altitude (616 mbar):	8.0...12.0 V
Resistance between term. 2 (-) and term. 3 (+):	2.3...2.5 k Ω

Full-load leaning (from 2.85 to 8.85)

● Electrical resistance at ambient temperature	approx. 120 k Ω
---	---------------------------

Voltage divider (as of 9.85)

- Electrical internal resistance

R ₁ (between term. 1 and term. 2)	82...100 k Ω
R ₂ (between term. 1 and term. 3)	56...68 k Ω

Idle adjustment (Engine at op. temp., approx. +80°C)

● Manual transmission	Ignition distributor 0 237 002 096	800...900 min ⁻¹
Autom. transmission		700...800 min ⁻¹
● Manual transmission	Ignition distributor 0 237 002 111	800...900 min ⁻¹
Autom. transmission		850...950 min ⁻¹

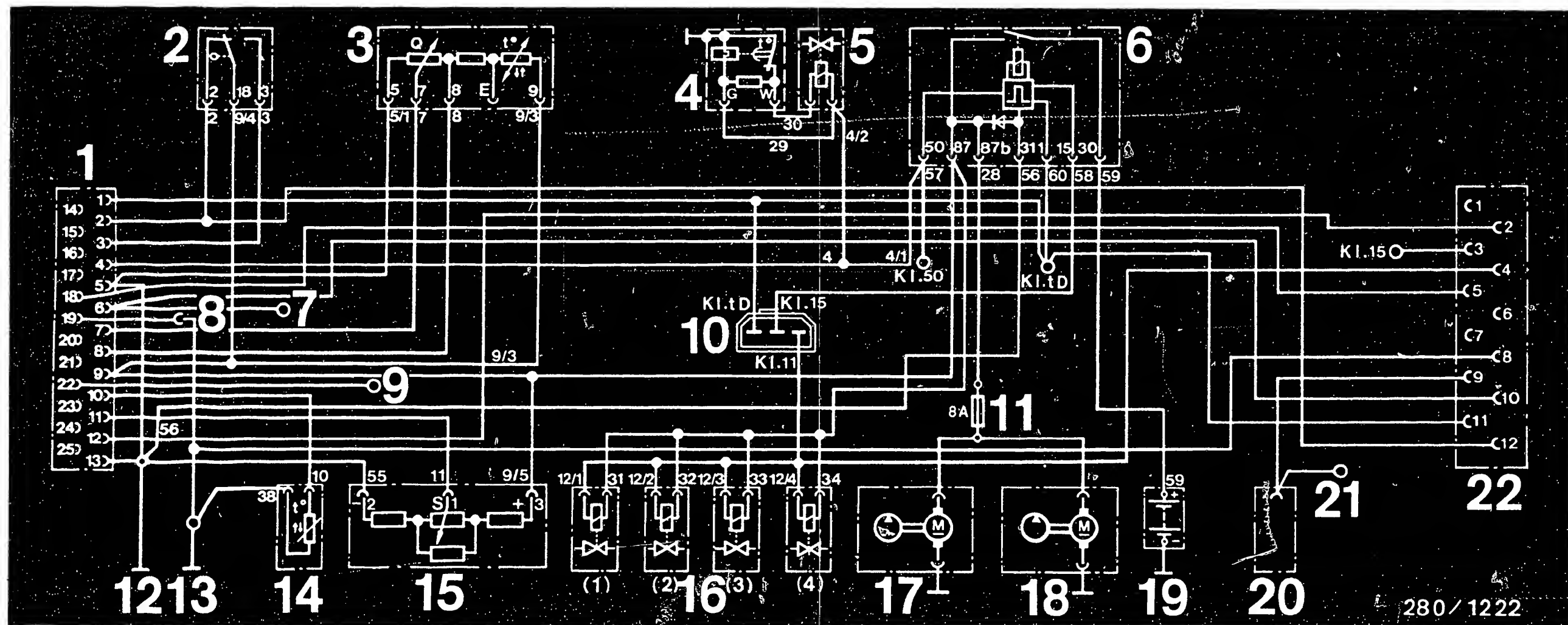
CO adjustment (engine at op. temp. approx. +80°C)

0.2...1.2
vol. %

Switch off extractor system while measuring and adjusting the exhaust. Follow accident-prevention regulations.

See equipment and Autodata microcards for settings for ignition, valve clearance and other engine data.





Electrical terminal diagram - BMW 318i EU - prepared for catalytic converter (1.85)

- | | | |
|---|---|------------------------------------|
| 1 = Control-unit plug | 9 = Integrator output | 16 = Injection valves |
| 2 = Throttle-valve switch | Diagnostic socket - pin 5 | 17 = Electric fuel pump |
| 3 = Air-flow sensor | 10 = Connection for injection and on-board computer | 18 = In-tank pre-supply pump |
| 4 = Thermo-time switch | 11 = Pump fuse | 19 = Battery |
| 5 = Start valve | 12 = Output-stage ground terminal | 20 = Air-conditioner control relay |
| 6 = Control relay | 13 = Electronics ground terminal | 21 = To idle controller term. 11 |
| 7 = Load signal to knock-protection relay term. 4 | 14 = Temperature sensor II | 22 = Relay for idle stabilization |
| 8 = Data encoding open
connected means 1 % leaning | 15 = Pressure sensor (altitude sensor) | |

J9

Electrical terminal diagram

BMW



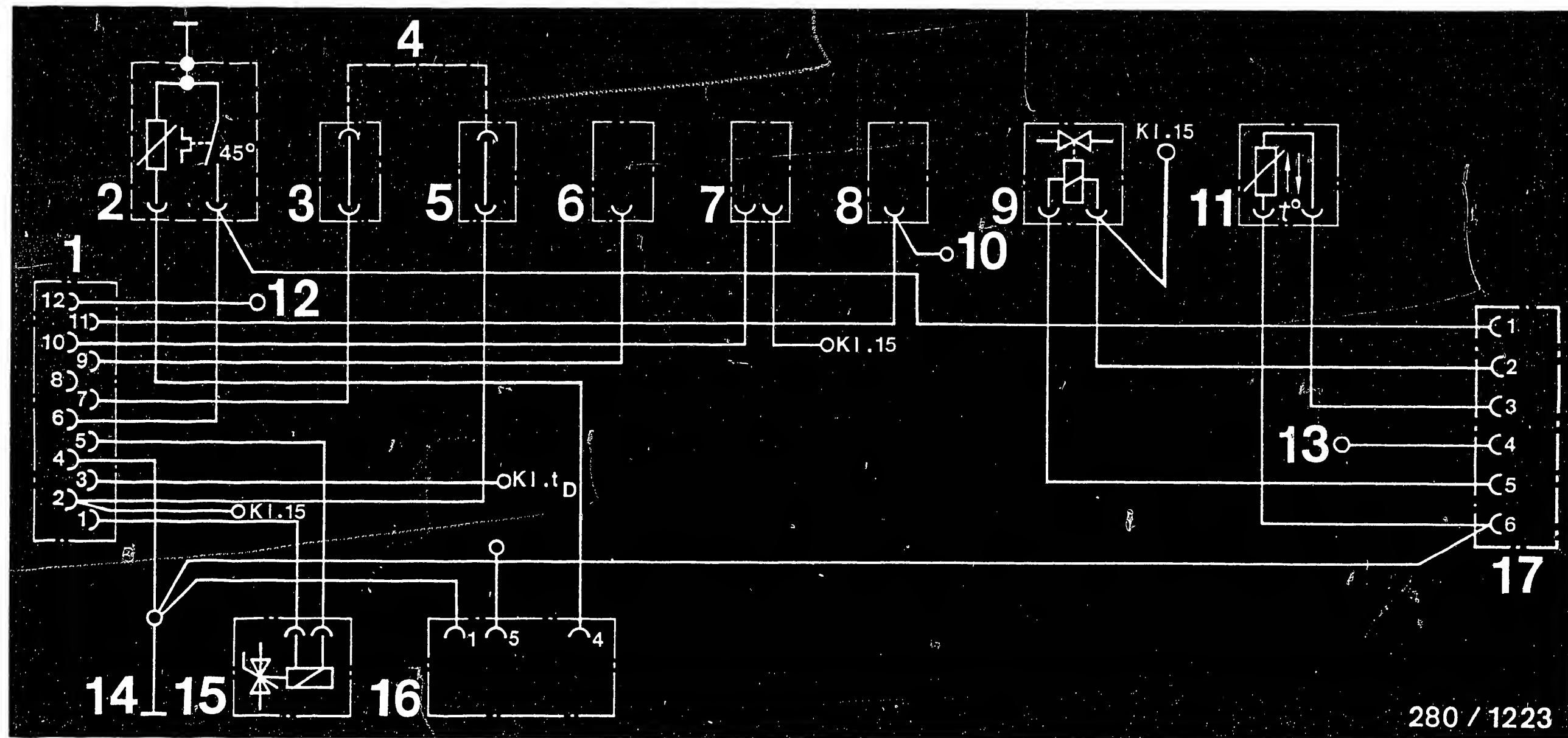
J10

Electrical terminal diagram

BMW



280/1222



280 / 1223

Terminal diagram (knock protection and idle-speed control) - non-Bosch products

BMW 318i EU - prepared for catalytic converter (1.85)

- | | | |
|---|--|-----------------------------------|
| 1 = Idle controller | 7 = Thermo-switch 0°C | 12 = To term. 2 - LE control unit |
| 2 = Remote-thermometer sensor | 8 = Air-conditioner control relay | 13 = To term. 6 - LE control unit |
| 3 = Automatic transmission connection | 9 = Solenoid-operated valve | 14 = Electronics ground terminal |
| 4 = Plugged together in case of manually-shifted transmission | 10 = To relay for idle stabilization term. 9 | 15 = Idle actuator |
| 5 = Connection term. 15 | 11 = Air-temperature sensor (intake-air snorkel) | 16 = Diagnostic socket |
| 6 = Air conditioner wiring harness | | 17 = Knock-protection relay |

J11

Electrical terminal diagram

BMW

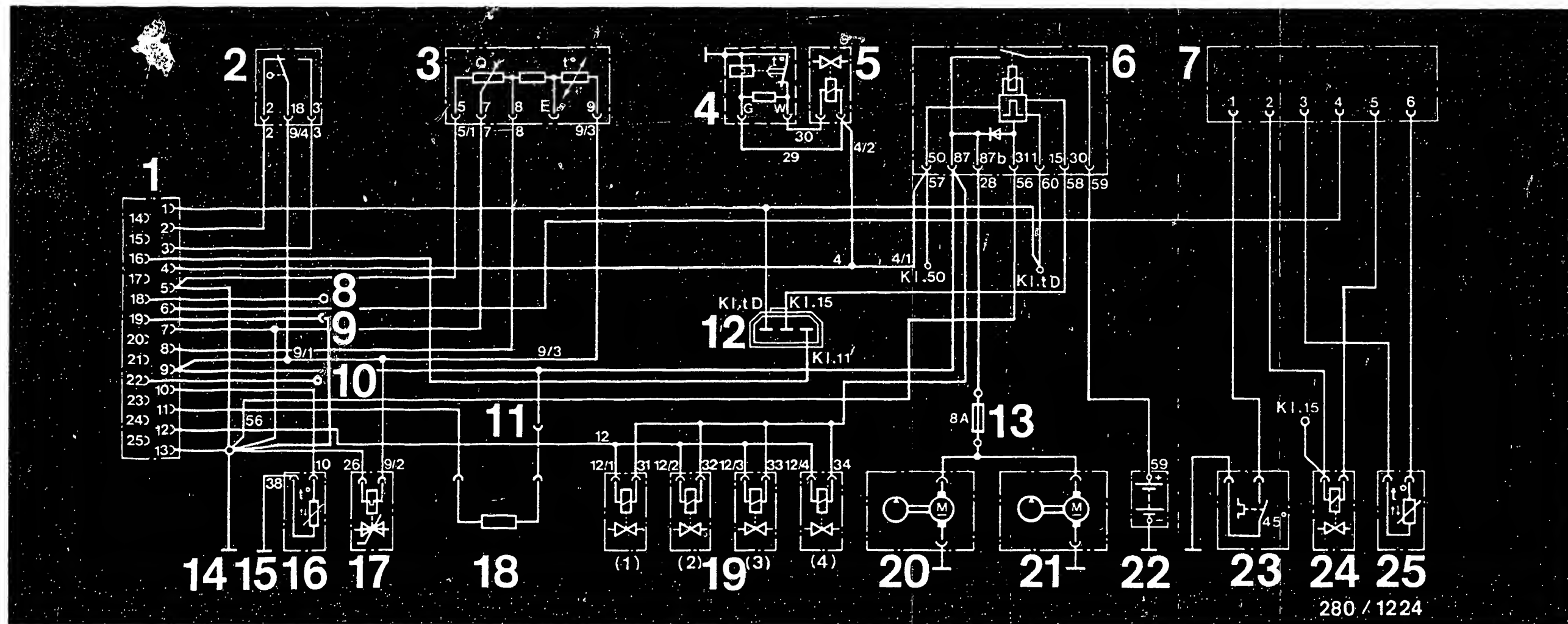


J12

Electrical terminal diagram

BMW





Electrical terminal diagram - BMW 318i EU - catalytic converter from 2/85 to 8.85

- | | | |
|-------------------------------------|-----------------------------------|------------------------------------|
| 1 = Control-unit plug | 10 = Integrator output | 18 = Full-load leaning 120 kΩ |
| 2 = Throttle-valve switch | Diagnostic socket - pin 5 | (in handle cover on control- |
| 3 = Air-flow sensor | 11 = Plug connector, connected if | unit plug) |
| 4 = Thermo-time switch | operating without catalytic | 19 = Injection valves |
| 5 = Start valve | converter | 20 = Electric fuel pump |
| 6 = Control relay | 12 = Connection for injection and | 21 = In-tank pre-supply pump |
| 7 = Knock-protection relay | and on-board computer | 22 = Battery |
| 8 = Only in case of air conditioner | 13 = Pump fuse | 23 = Thermo-switch +45°C |
| to NOC relay term. 87 | 14 = Output-stage ground terminal | 24 = Solenoid-operated change-over |
| 9 = Data encoding <u>open</u> | 15 = Electronics ground terminal | valve |
| connected means 1 % leaning | 16 = Temperature sensor II | 25 = Intake-air temperature sensor |
| | 17 = Auxiliary-air device | |

J13

Electrical terminal diagram

BMW

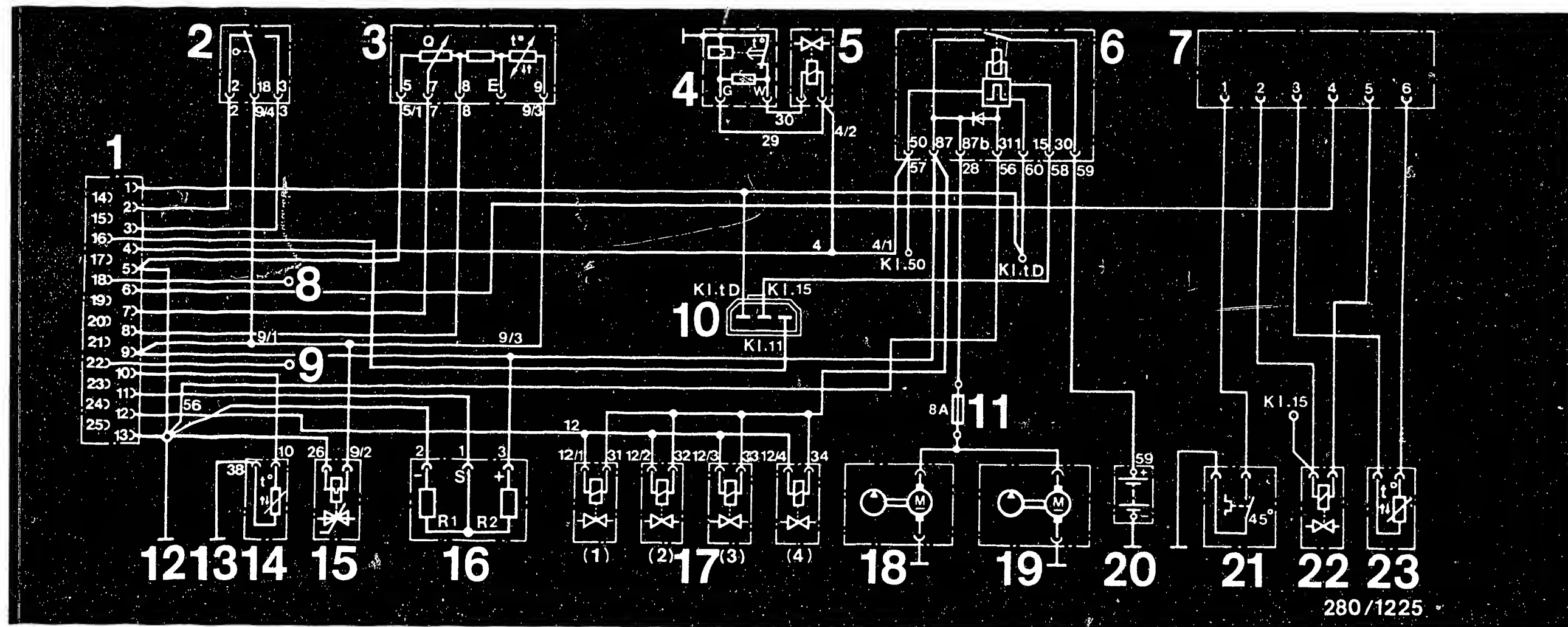


J14

Electrical terminal diagram

BMW





Electrical terminal diagram - BMW 318i EU - catalytic converter from 9.85 to 11.85

- | | | |
|---|---|---|
| 1 = Control-unit plug | 9 = Integrator output | 16 = Voltage divider $R_1 = 91 \text{ k}\Omega$ |
| 2 = Throttle-valve switch | Diagnostic socket - pin 6 | $R_2 = 62 \text{ k}\Omega$ |
| 3 = Air-flow sensor | 10 = Connection for injection and on-board computer | 17 = Injection valves |
| 4 = Thermo-time switch | 11 = Pump fuse | 18 = Electric fuel pump |
| 5 = Start valve | 12 = Output-stage ground terminal | 19 = In-tank pre-supply pump |
| 6 = Control relay | 13 = Electronics ground terminal | 20 = Battery |
| 7 = Knock-protection relay | 14 = Temperature sensor II | 21 = Thermo-switch + 45°C |
| 8 = Only in case of air conditioner to NOC relay term. 87 | 15 = Auxiliary-air device | 22 = Solenoid-operated change-over valve |
| | | 23 = Intake-air temperature sensor |

J15

Electrical terminal diagram

BMW

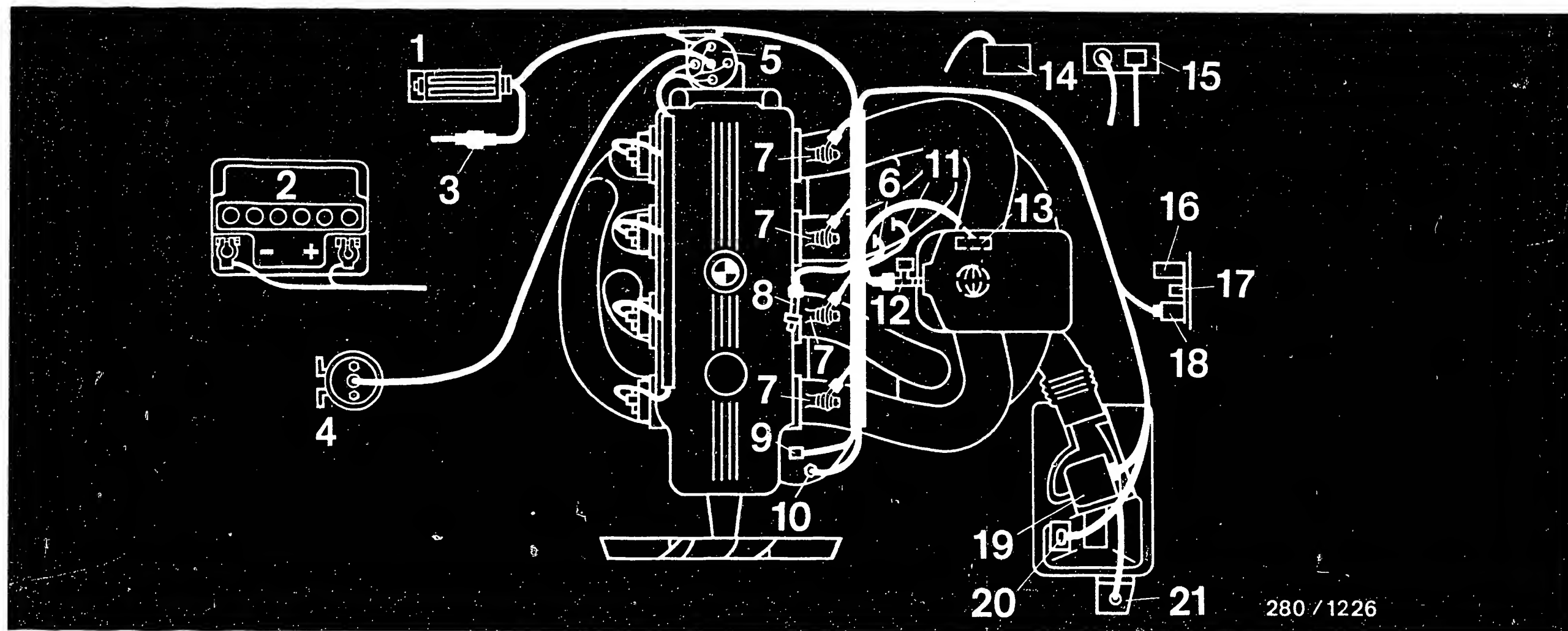


J16

Electrical terminal diagram

BMW





ELECTRICAL WIRING DIAGRAM - BMW 318i - EUROPE- PREPARED FOR CATALYTIC CONVERTER FROM 1.85

- 1 = Control-unit plug
- 2 = Battery
- 3 = Plug connector for term. t_D ,
term. 15, term. 12, control unit
- 4 = Ignition coil
- 5 = Ignition distributor
- 6 = Output-stage ground terminal
- 7 = Injection valves
- 8 = Auxiliary-air device (as of 2.85)
Idle actuator (1.85)

- 9 = Temperature sensor II
- 10 = Thermo-time switch
- 11 = Electronics ground terminal
- 12 = Start valve
- 13 = Throttle-valve switch
- 14 = Solenoid-operated valve
- 15 = Timing-advance unit
- 16 = Knock-protection relay

- 17 = Relay for idle stabilization (1.85)
NOC relay (as of 2.85)
- 18 = Control relay
- 19 = Air-flow sensor
- 20 = Altitude sensor (1.85)
Voltage divider (from 9.85 to
11.85)
- 21 = Intake-air temperature sensor

J17

Electrical wiring diagram

BMW

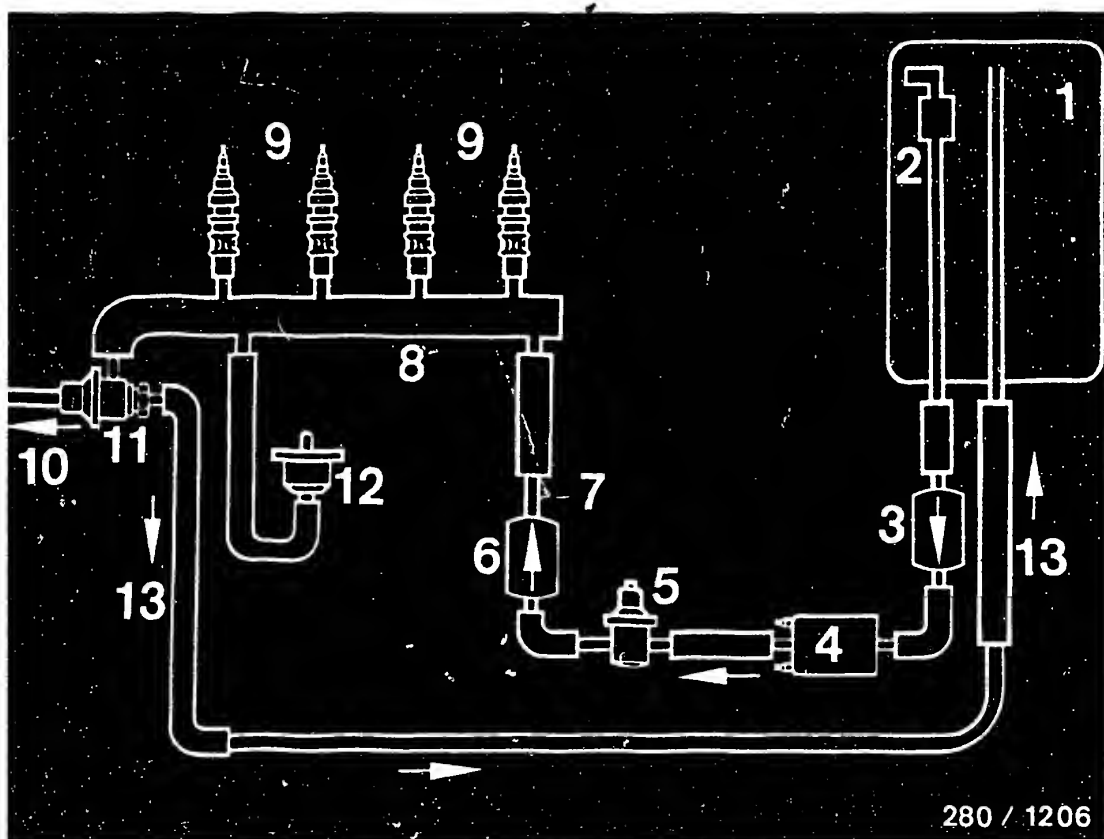


J18

Electrical wiring diagram

BMW

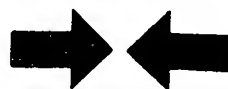


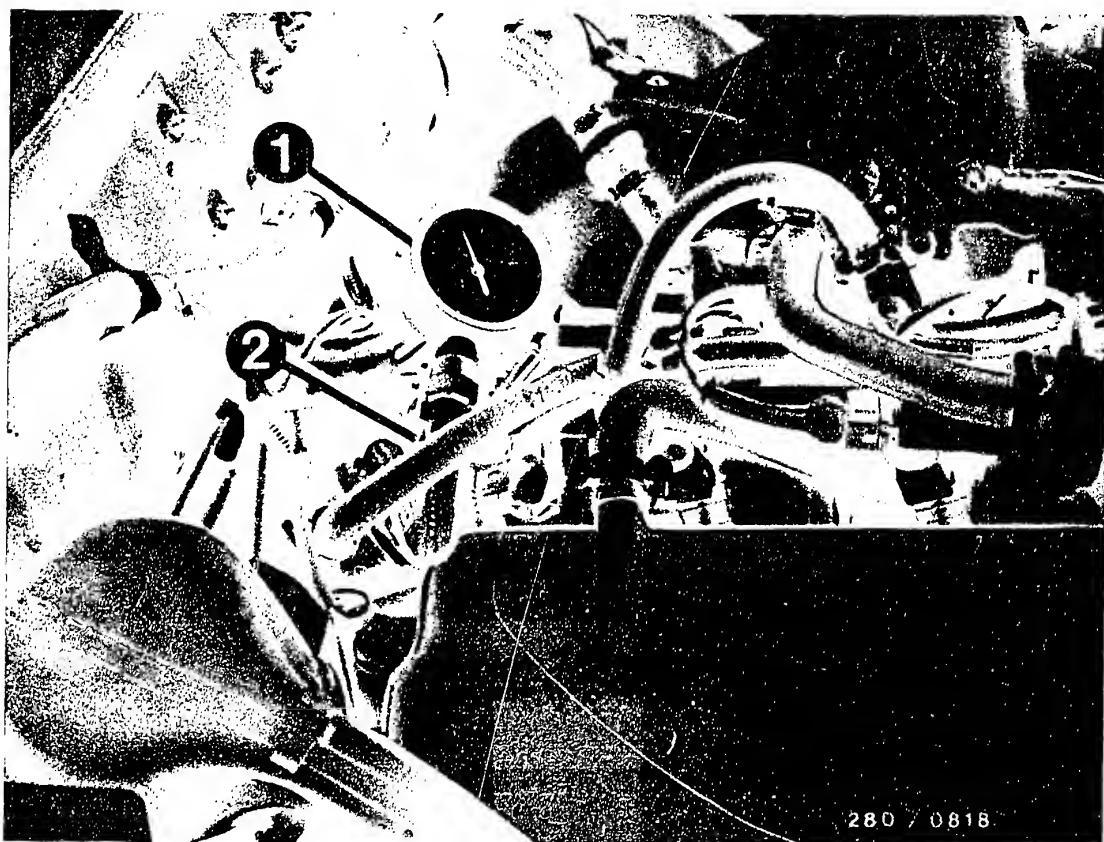


280 / 1206

DIAGRAM OF FUEL LINES

- 1 = Fuel tank
- 2 = In-tank pre-supply pump
- 3 = Fuel spinner
- 4 = Electric fuel pump
- 5 = Fuel-line-pressure damper
- 6 = Fuel filter
- 7 = Fuel delivery line
- 8 = Fuel-distribution pipe
- 9 = Solenoid-operated injection valves
- 10 = Connection to intake manifold
- 11 = Pressure regulator
- 12 = Start valve
- 13 = Fuel return line





1 = Pressure gauge

2 = Delivery line to fuel-distribution pipe

Fuel pressure test

Connect pressure gauge/pressure tester. Disconnect hose of delivery line from fuel-distribution pipe.

Connect pressure gauge.

Make sure there are no leaks.

Caution: When unscrewing the hose, make sure that no fuel gets onto hot parts of the engine.



INSTALLATION POSITION OF COMPONENTS

The indications "left" and "right" apply always as viewed in the forward direction of travel.

Control unit: (Top picture)

The control unit is in the passenger compartment, front-passenger side, in glove compartment behind a cover.

- 1 = Control unit
- 2 = Plug connector term. t_0
- 3 = Fastening screws for control-unit cover

To connect the universal test adapter, unplug control-unit plug (25-pin). To do this, push detent in direction of arrow.

Electric fuel pump (center picture)

The electric fuel pump is under the vehicle on the left-hand side in front of the left-hand rear wheel.

- 1 = Fuel-line pressure damper
- 2 = Electric fuel pump
- 3 = Fuel delivery line
- 4 = Fuel spinner
- 5 = Fuel return line

Arrow = Direction of fuel flow

In-tank immersion-tube sensor with in-tank pre-supply pump (bottom picture)

The installation position is in the passenger compartment on the right-hand side under the rear seat bench.

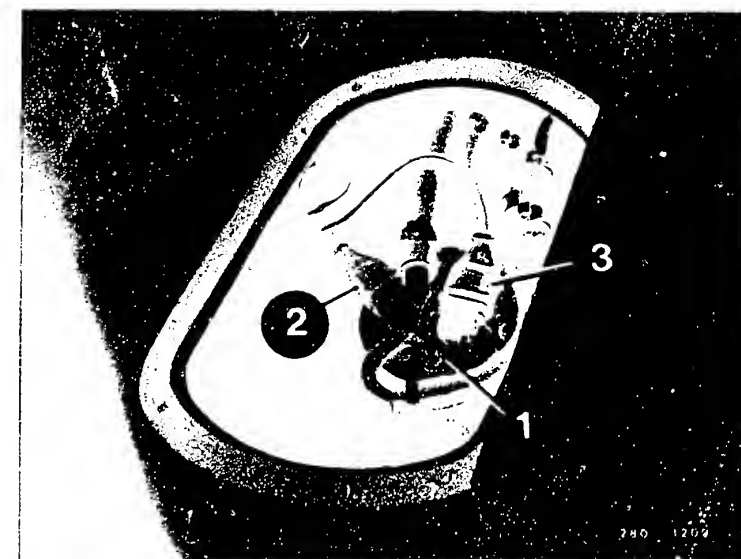
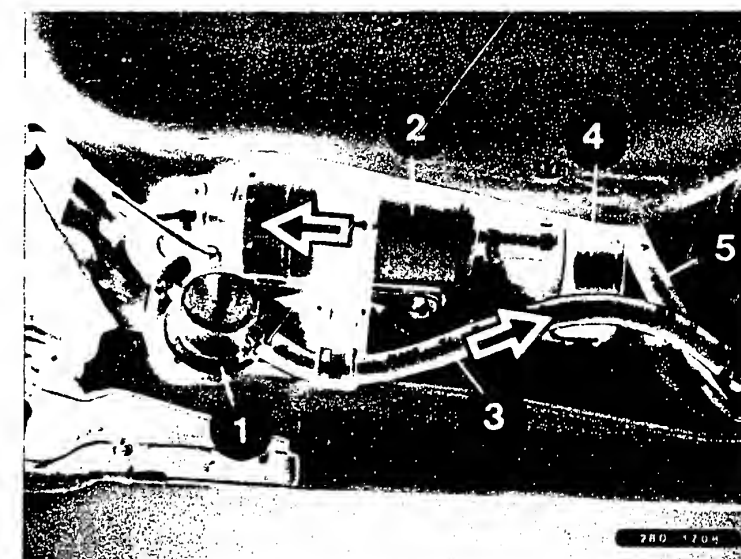
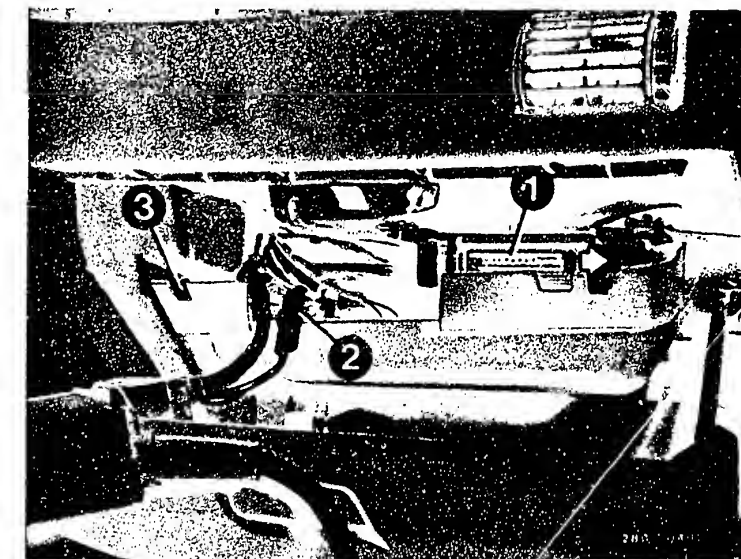
- 1 = Immersion-tube sensor with in-tank pre-supply pump
- 2 = Electrical connection of pre-supply pump
- 3 = Electrical connection of immersion-tube sensor

Testing the immersion-tube sensor

Resistance measurement between term. G and term. 31 with float in "empty" and "full" positions. The resistance curve (deflection) must be continuous.

Empty = approx. 2.5 ... 4.0 Ω

Full = approx. 56.5 ... 61.0 Ω



J21

Installation position of components

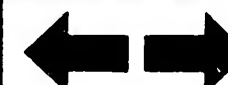
BMW

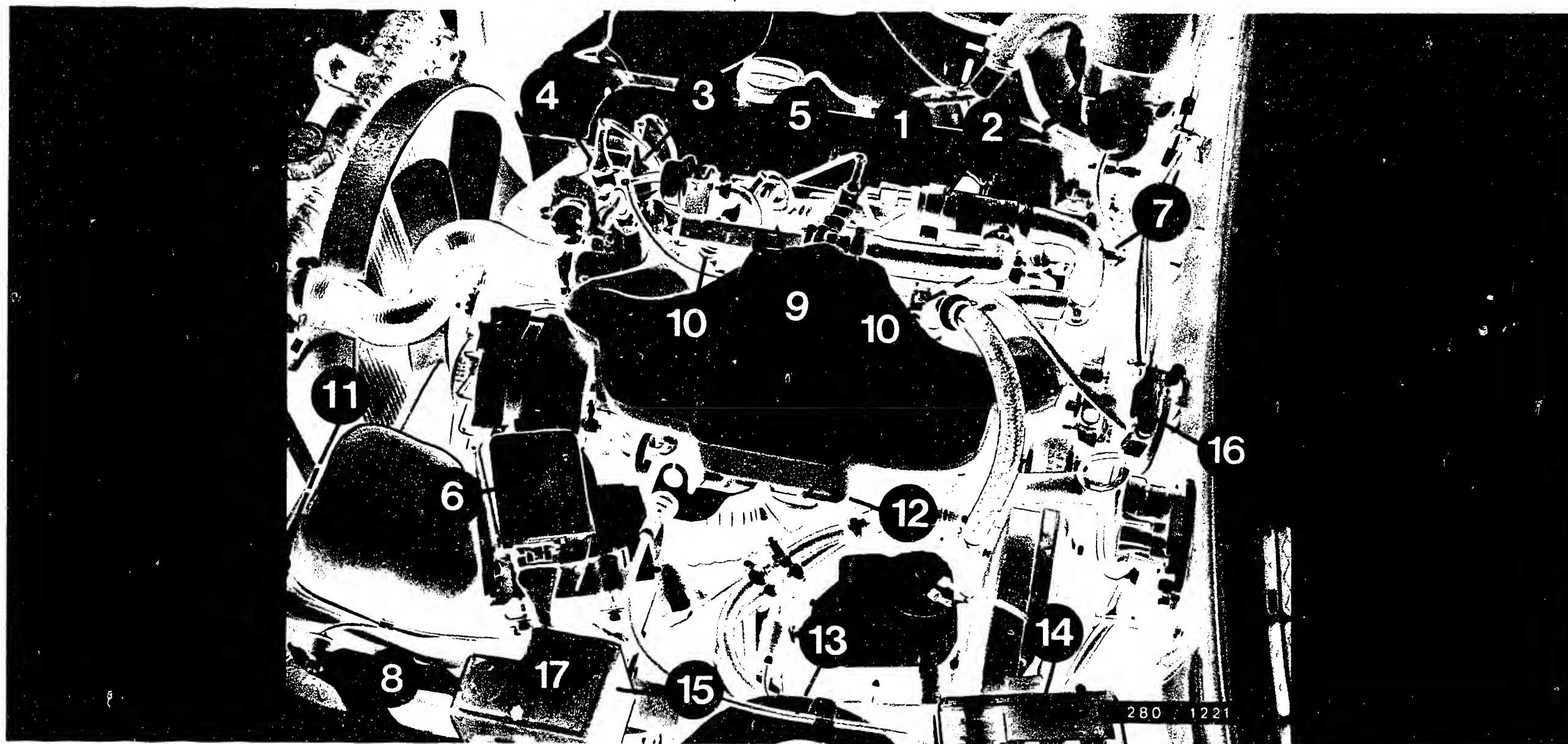


J22

Installation position of components

BMW





Installation position of components - BMW 318i - Europe (prepared for catalytic converter)

- | | | |
|---|--------------------------------------|--|
| 1 = Start valve | 7 = Fuel-line-pressure damper | 13 = Fuel filter |
| 2 = Idle actuator (non-Bösch product) (1.85), afterwards auxiliary-air device | 8 = Control relay (under cover) | 14 = Pump fuse no. 11 |
| 3 = Temperature sensor II (white plug) | 9 = Ground terminals | 15 = Knock-protection relay |
| 4 = Thermo-time switch (brown plug) | 10 = Injection valves | 16 = Solenoid-operated valve |
| 5 = Pressure regulator | 11 = Temperature sensor (intake air) | 17 = Relay for idle stabilization 1.85, as of 2.85 NOC relay |
| 6 = Air-flow sensor | 12 = Throttle-valve switch | |

J23

Installation position of components

BMW



J24

Installation position of components

BMW



TABLE OF CONTENTS

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Fuel-pressure test.....	K 11
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SPECIAL FEATURES

This microcard contains the LE-Jetronic trouble-shooting instructions for the following model valid at the time of printing:

- K75 3-cylinder, 0.75 l capacity 55 kW (75 HP-DIN) as of 8.85 with LE2-Jetronic
- Cold-start control (no start valve or thermo-time switch).
- Adaptive overrun cutoff
- O-ring connections on solenoid-operated injection valves.
- Electric fuel pump as in-tank pump and fuel filter in fuel tank.
- Choke lever instead of auxiliary-air device.
- Double temperature sensor II (engine) for Jetronic and engine fan.
- Throttle valve adjustment by measuring the pressure drop across the individual throttle valves.
- t_p triggering of LE2 control unit

Remarks:

The LE2-Jetronic in the BMW K75 motorcycle is basically the same as that in the BMW K100 motorcycle

- Similar SIS repair instructions:
SIS microcard BMW 503

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced LE-Jetronic expert to quickly check the electrical part of the system with the universal test adapter.

The rapid diagnosis chart contains the following information

- Sequence of test steps
- Position of V and Ω program switches
- Notes on how to operate the universal test adapter or other components
- Test specifications for motor tester and multimeter



Rapid Diagnosis Chart for Universal Test Adapter

<u>Test Step</u>	<u>Switch Setting</u>		<u>Measurement</u>	<u>Remarks</u>	<u>Test Specifications (Reading)</u>
	V	Ω			
1	5	-	Signal from term. t_D . <u>Caution:</u> Measurement of resistance in red (+) and black (-) test sockets (correct polarity of measuring equipment important) This test setup applies only to test step 1. Measurement 1: at rest Measurement 2: ignition "ON" and start. On control-unit plug between term. 1 and term. 5	Shift gear to neutral, start.	<u>Change of resistance between measurements 1 and 2</u>
2	6	-	Voltage from control relay term. 87 On control-unit plug between term. 9 and term. 5	Shift gear to neutral, start.	<u>8 ... 15 V</u>
3	7	-	Voltage from starting motor term. 50 On control-unit plug between term. 4 and term. 5	Shift gear to neutral, start.	<u>5 ... 10 V</u>

K3

Rapid diagnosis chart

BMW motorcycle










K4

Rapid diagnosis chart

BMW motorcycle



Rapid Diagnosis Chart for Universal Test Adapter (continued)

<u>Test Step</u>	<u>Switch Setting</u>		<u>Measurement</u>	<u>Remarks</u>	<u>Test Specifications (Reading)</u>
	V	Ω			
4		11	Resistance combination in air-flow sensor. On control-unit plug between term. 8 and term. 5	Jumper on injection relay between term. 87 and term. 87b 1) Reading without jumper	$100...200 \Omega$ 1) $340...450 \Omega$
5		12	Resistance of air-flow sensor potentiometer. On control-unit plug between term. 7 and term. 5	Deflect air-flow sensor flap as far as it will go	$60...1000 \Omega$
6		13	Resistance of temperature sensor NTC II (engine temperature). On control-unit plug between term. 10 and term. 5	----	(+15°C...+30°C): $1.45...3.3 \text{ k}\Omega$ approx. +80°C: $280...360 \Omega$
7		14	Resistance of output stage ground On control-unit plug between term. 13 and term. 5	----	$0...10 \Omega$
8		16	Resistance of idle contact in throttle-valve switch On control-unit plug between term. 2 and term. 9	Throttle grip in rest position ----- Throttle grip slightly opened	$0...10 \Omega$ ----- ∞
9		17	Resistance of full-load contact in throttle-valve switch On control-unit plug between term. 3 and term. 9	Throttle grip fully opened (full-load position) ----- Throttle grip turned back slightly.	$0...10 \Omega$ ----- ∞
10		18	Resistance of all 3 parallel-connected injection valves. On control-unit plug between term. 12 and term. 9	----	+ 15°C...+30°C $8.2...10.9 \Omega$ approx. +80°C: $8.7...11.70 \Omega$

K5

Rapid diagnosis chart
BMW motorcycle



K6

Rapid diagnosis chart
BMW motorcycle



TEST SPECIFICATIONS

Pressure Regulator

- fuel pressure 2.3...2.7 bar

Electric Fuel Pump

- fuel delivery (measured in return): min. 650 cm³/30s
- terminal voltage (under load): min. 12 V

Temperature Sensor II (engine)

- electrical internal resistance at ambient temperature (+15°C...+50°C): 1.45...3.3 kΩ
- with engine at op. temp. (approx. +80°C): 280...360 Ω

Solenoid-operated Injection Valve (at +20°C)

- electrical internal resistance 15.0...17.5 Ω

Air-flow Sensor

- resistance between
 - term. 8 and term. 5: 340...450 Ω
 - term. 7 and term. 5 (sensor flap fully deflected) 60...1000 Ω
 - term. 9 and term. 5: 500...760 Ω
 - term. 8 and term. 9: 160...300 Ω

Idle adjustment (engine at normal operating temperature approx. +80°C)

Idle Speed: 900...1000 min⁻¹

CO Setting: 2.0...2.5 Vol%CO

Switch off exhaust system while measuring and adjusting the exhaust. Follow accident-prevention regulations.

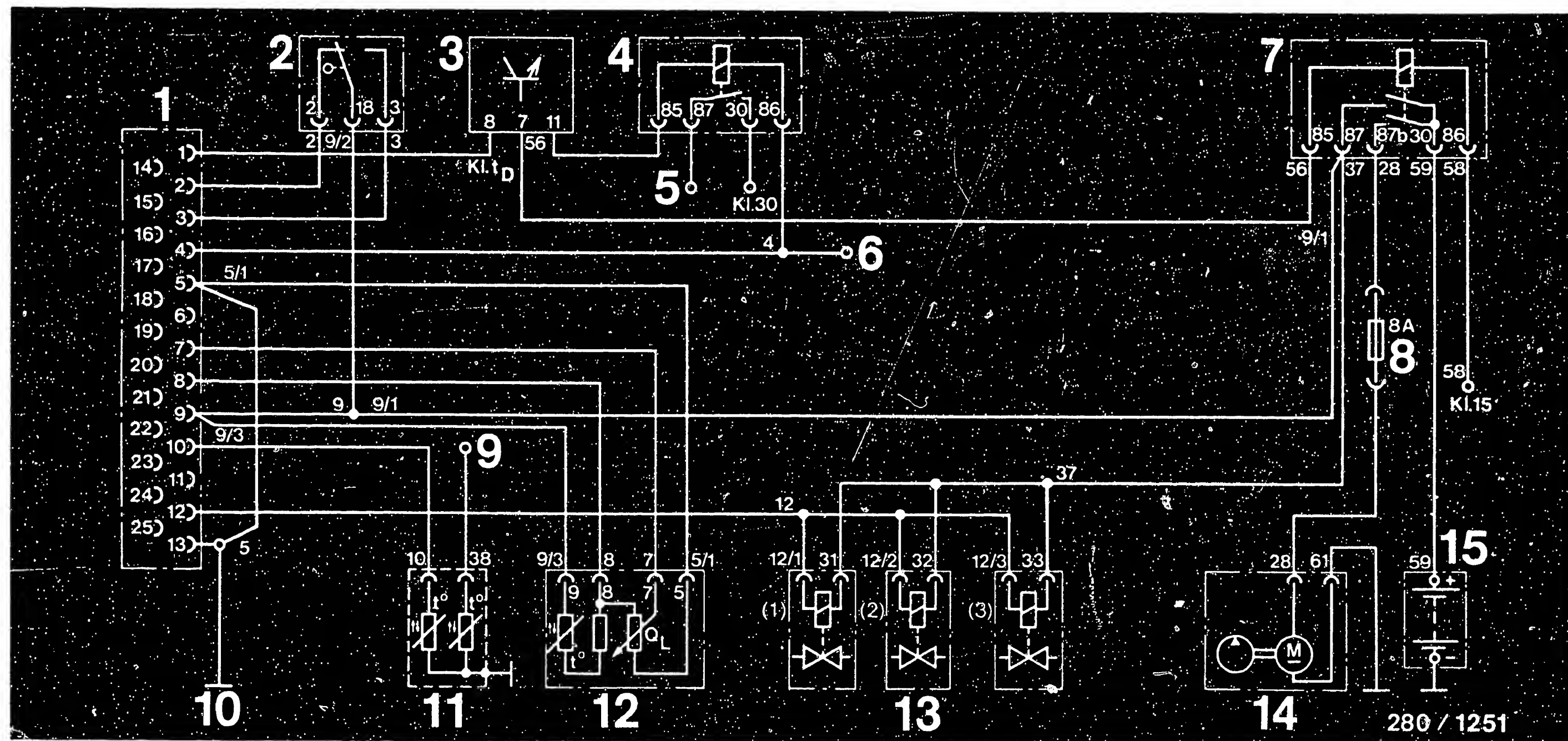
See equipment and Autodata microfiches for settings for ignition, valve clearance and other engine data.

K7

Test specifications

BMW motorcycle





ELECTRICAL TERMINAL DIAGRAM

- 1 = Control-unit plug
- 2 = Throttle-valve switch
- 3 = Timing-advance unit
- 4 = Start-locking relay
- 5 = To starting motor
- 6 = To starting switch
- 7 = Injection relay

- 8 = Pump fuse no. 6
- 9 = To temp. trigger box term. no. E
- 10 = Central ground terminal
- 11 = Double temperature sensor
 - (1 x engine temperature - Jetronic
 - 1 x engine temperature - fan)

- ```
12 = Air-flow sensor
13 = Injection valves
14 = Electric fuel pump (in-tank pump)
15 = Battery
```



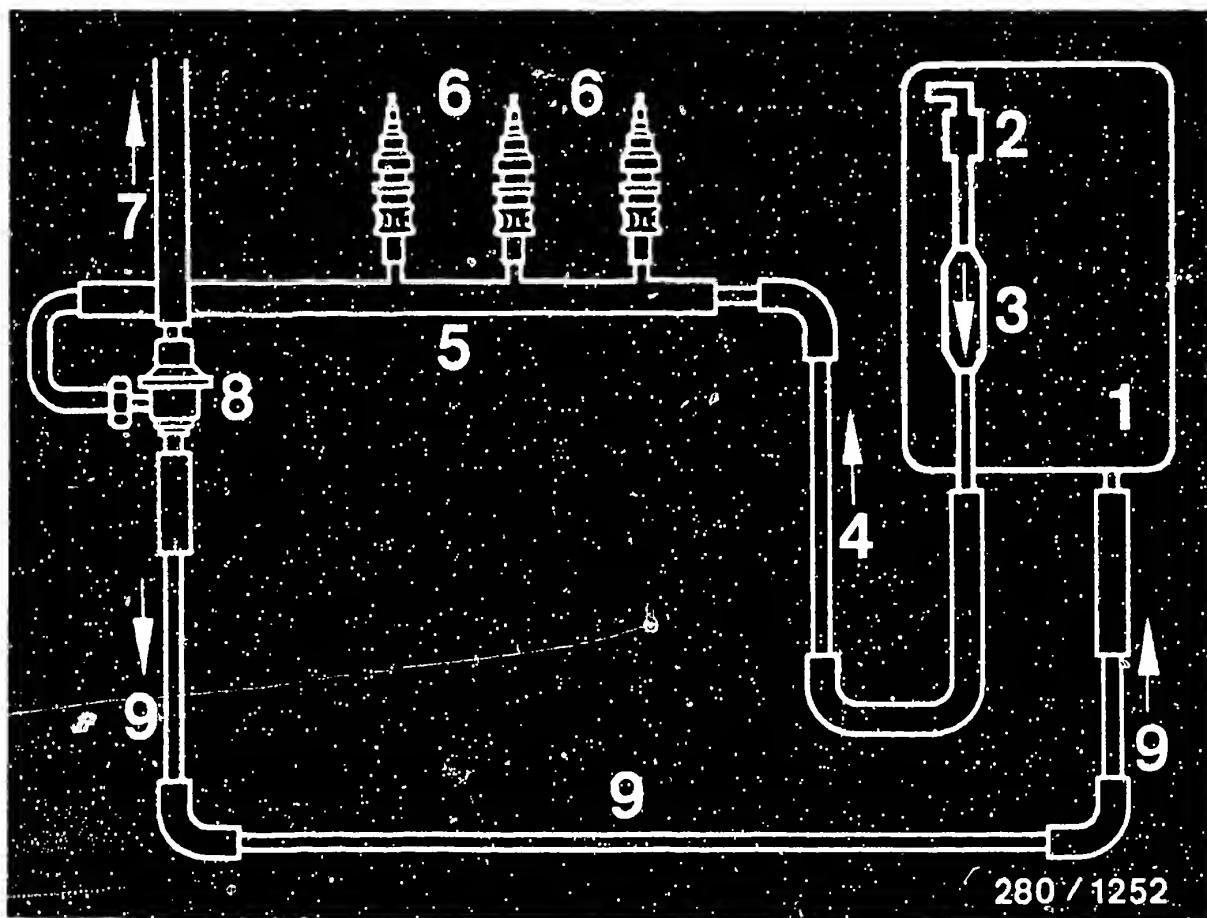
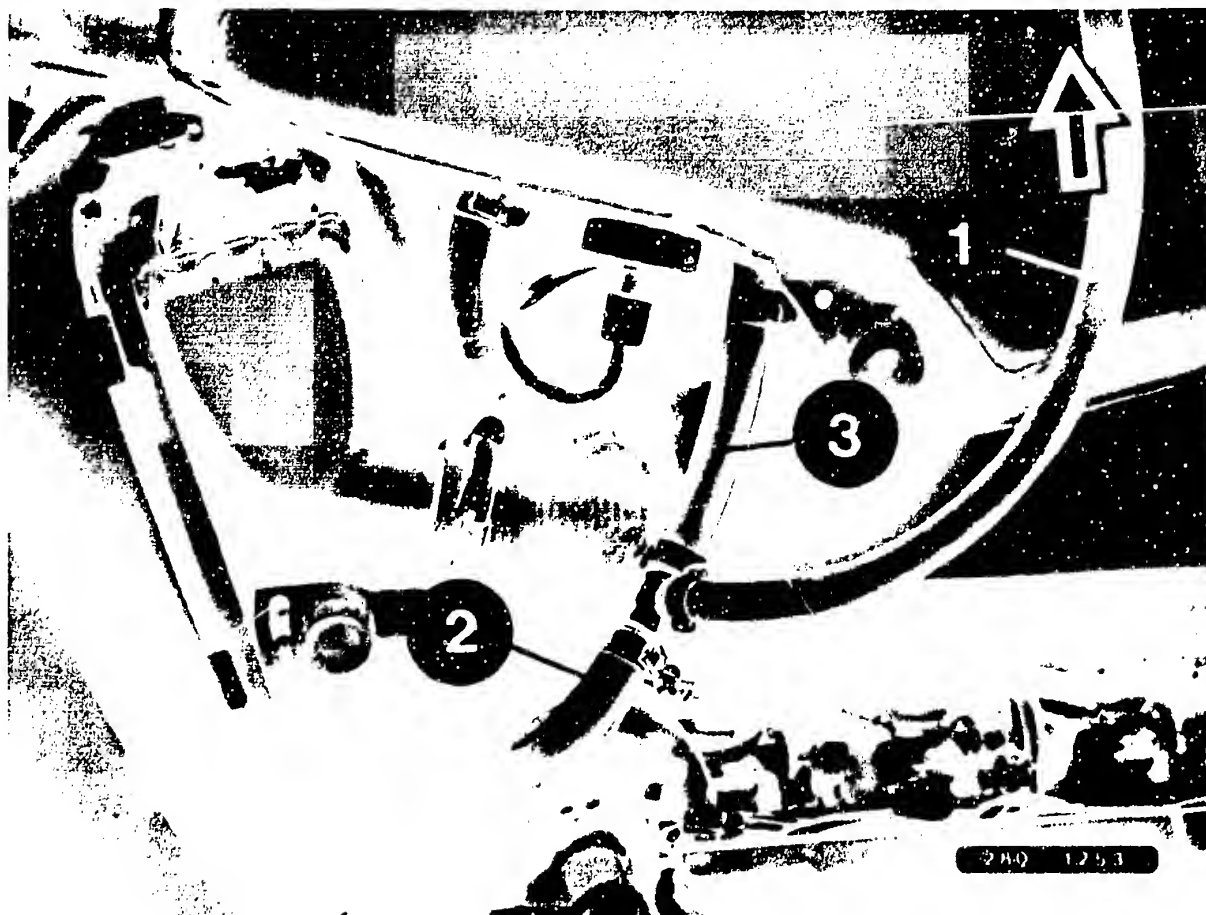


DIAGRAM OF FUEL LINES

- 1 = Fuel tank
- 2 = In-tank fuel pump
- 3 = Fuel filter
- 4 = Fuel delivery line
- 5 = Fuel-distribution pipe
- 6 = Solenoid-operated injection valves
- 7 = To intake manifold
- 8 = Pressure regulator
- 9 = Fuel return line



1 = Pressure gauge  
2 = Fuel delivery line

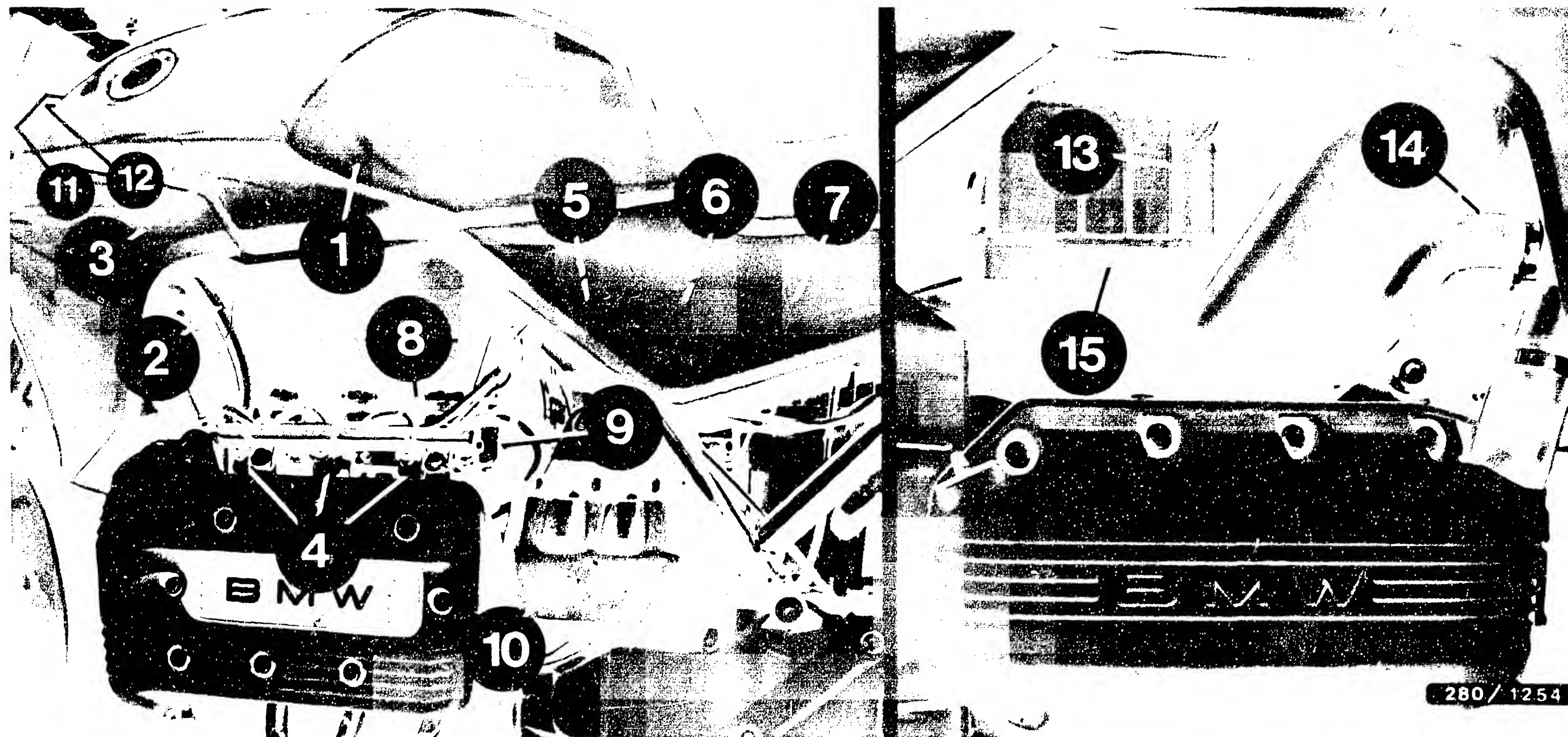
3 = Y-piece with hose

### Fuel-pressure test

Connect pressure gauge/pressure tester. Disconnect delivery-line hose from fuel-distribution pipe. Connect pressure gauge. Make sure there are no leaks.

Caution: When unscrewing the hose, make sure that no fuel gets onto hot parts of the engine.





# INSTALLATION POSITION OF COMPONENTS

- 1 = Electric in-tank fuel pump and fuel filter
- 2 = Fuel delivery line
- 3 = Fuel return line
- 4 = Injection valves

- 5 = Central-electrics box (with injection relay and start-locking relay)
- 6 = Fuse box with pump fuse
- 7 = LE control unit

- 8 = Pressure regulator
- 9 = Throttle-valve switch
- 10 = Ignition coils
- 11 = Timing-advance unit
- 12 = Central ground
- 13 = Air-flow sensor

- 14 = Temperature sensor (double NTC)
- 15 = Air filter

**K12**

Installation position of components  
BMW motorcycle



**K13**

Installation position of components  
BMW motorcycle





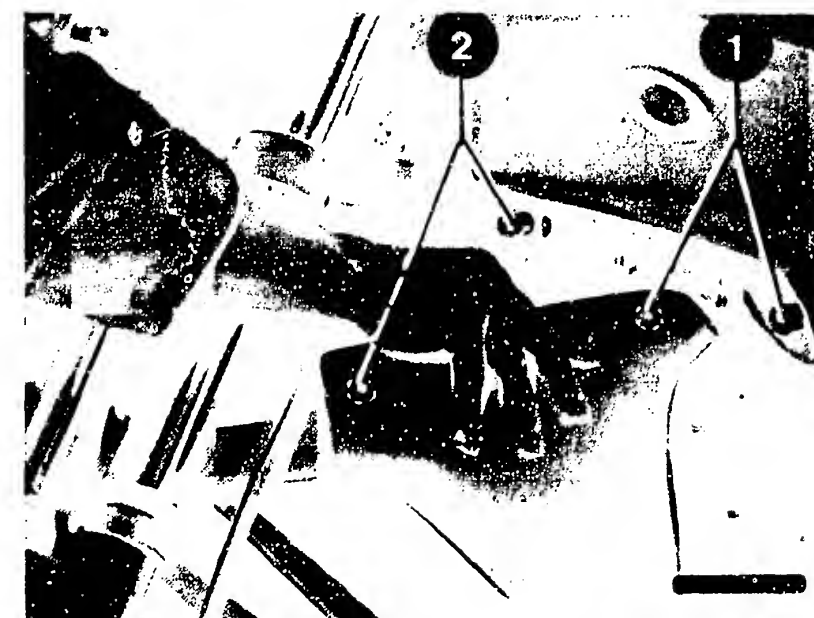
## Important general information

Preliminary operations in order to be able to remove the fuel tank and the LE control unit and/or in order to be able to make measurements on the timing-advance unit, injection relay and on the fuse box:

- Remove battery covers on left and right (top picture) (rubber plug-in connections) follow sequence of numbered arrows
  - Carefully pull off from frame at bottom (1)
  - Press cover downward out of fastening (on fuel tank) (2)
  - Pull cover forward out of seat-bench frame and take off (3)

Note on installation: The battery can be mounted more easily if the three rubber bearings are moistened.

- Unhook radiator covers on left and right (rubber plug-in connections) (bottom picture). Press out carefully.
  - Carefully pull left-hand and right-hand radiator covers slightly out of the rubber bearings on the fuel tank (1).
  - Lower the complete radiator cover (complete with side parts) and then take out laterally (2).



**K14**

Important general information  
BMW motorcycle



**K15**

Important general information  
BMW motorcycle



## Important general information (continued)

### Removal of fuel tank:

Before removal, the following instructions must be followed:

#### Caution:

Be careful when handling vehicle fuels. Avoid sparks.  
Risk of fire and explosion!

#### Top picture:

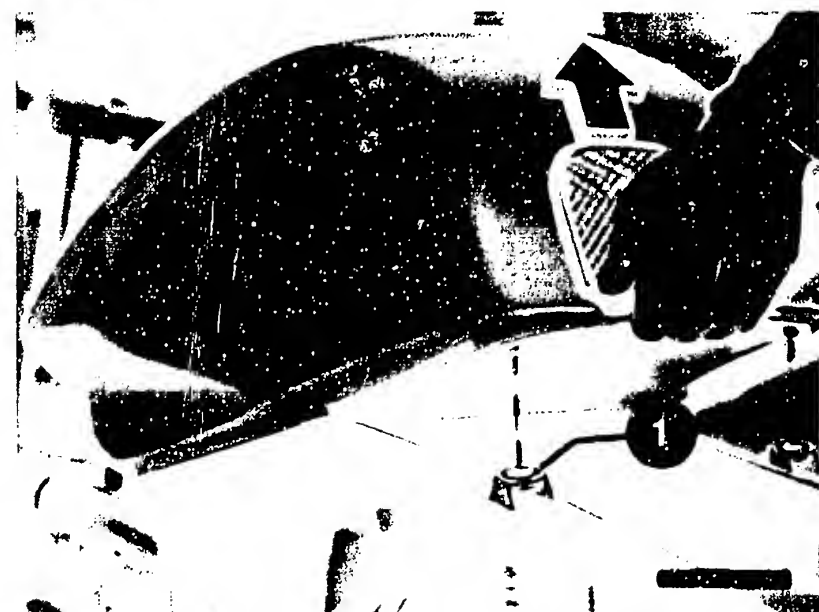
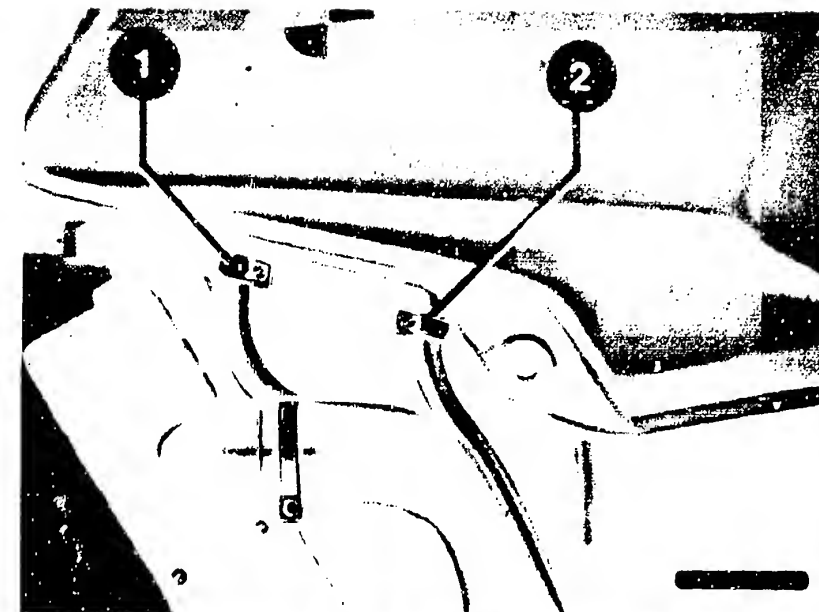
- Place rag under the hose clamps (1) and (2) to absorb leakage fuel.
- Loosen hose clamps (1) and (2); pull off fuel hoses.

#### Center picture:

- Pull electrical plug connector (1) from fuel-level sender out of clamp on tray at front right; take plug connector apart. Pull fuel-level sender lead through toward the inside.

#### Bottom picture:

- Pull fuel tank upward in direction of arrow out of two rubber bearings (1).
- Lift off fuel tank upward towards the rear.



**K16**

Important general information  
BMW motorcycle



**K17**

Important general information  
BMW motorcycle





## Important general information (continued)

### Removal of electric fuel pump:

- Loosen fastening screws for fuel filler neck (arrows in top picture) and take out neck.
- Loosen electrical connections as well as fuel delivery line on electric fuel pump (arrows in center picture).  
Picture shows cutaway model.
- Vigorously push together clamping hooks (arrows in bottom picture) on retaining ring and pull out electric fuel pump.

### Note on installation:

The positive pole of the electric fuel pump must point in the forward direction of travel. Illustration shows cutaway model.

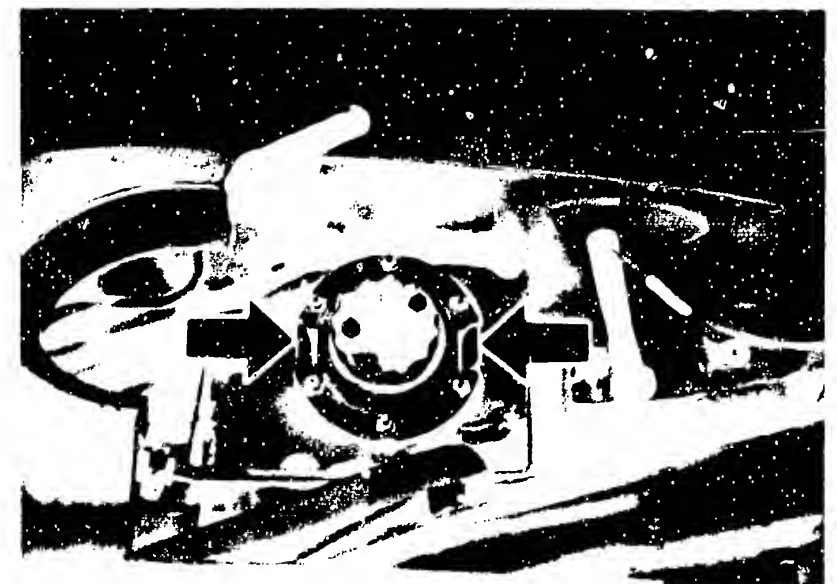
- Remove intake filter from electric fuel pump.
- Remove bonded-rubber metal jacket with retaining ring from electric fuel pump.

### Note on installation:

Slide rubber-bonded metal jacket onto electric fuel pump until it noticeably latches

### Removal of fuel filter:

- Loosen fastening screws for fuel filler neck (arrows in top picture) and take out neck.
- Loosen hose binder on delivery line (between fuel filter and electric fuel pump)
- Remove fuel filter with delivery line from filler neck.
- Remove fuel filter.



**K18**

Important general information  
BMW motorcycle



**K19**

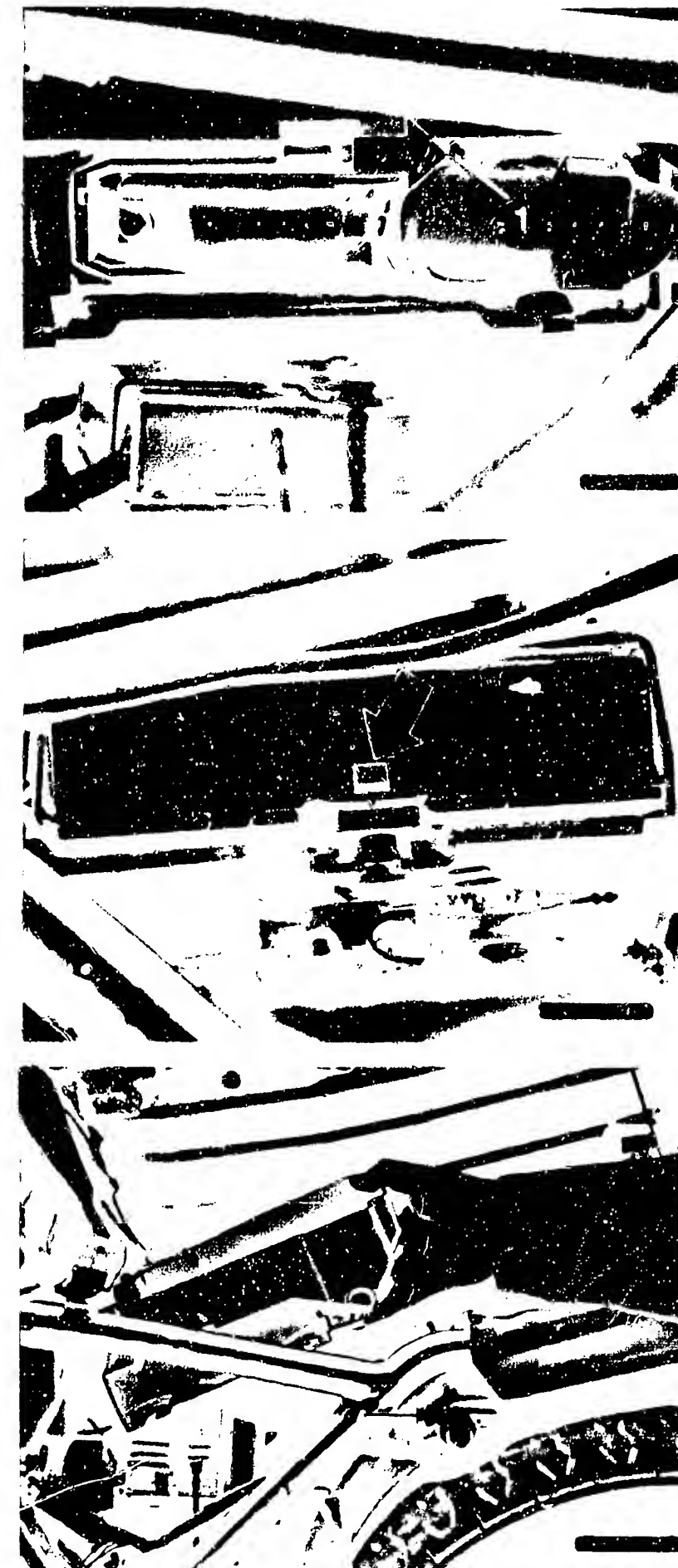
Important general information  
BMW motorcycle



## Important general information (continued)

### Removal of LE control unit

- Hinge up seat bench (unlock with ignition key).
- Remove battery covers on left and right
  - Carefully pull off at bottom from frame
  - Press downward out of fastening (on fuel tank)
  - Then pull forward and take off.
- Remove control-unit plug cover.
- Press detent (1) on control unit toward rear in direction of arrow and hinge out control-unit plug (top picture)
- Using flat pliers, pull out in upward direction the locking pin (arrow, center picture) for the control unit on the right.
- Lift out tray with control unit (bottom picture).



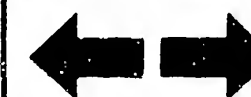
**K20**

Important general information  
BMW motorcycle



**K21**

Important general information  
BMW motorcycle



## Important general information (continued)

### Fuse box:

- To remove the transparent lid, lightly press together (top picture - arrows) and take off.
- Pump fuse (electric fuel pump) (top picture - Item 1).

### Caution:

If, during testing, the ignition has to be switched "ON", this means:

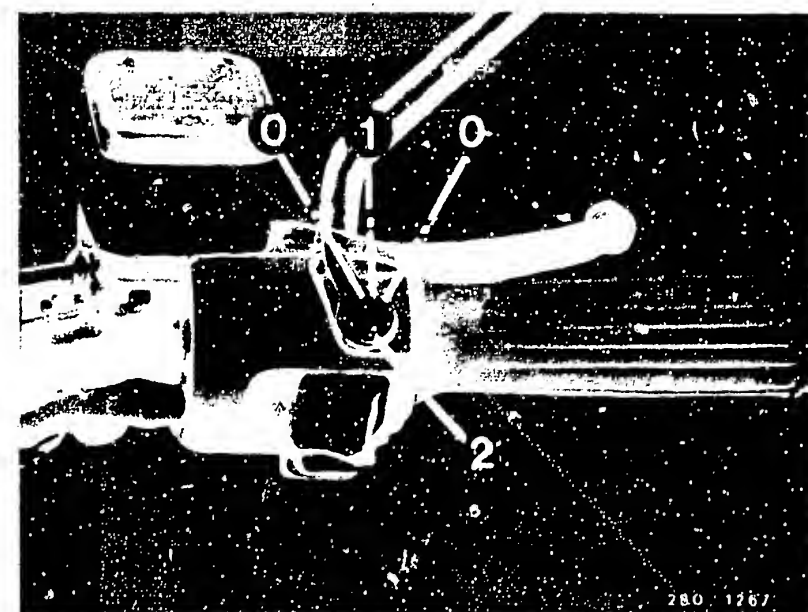
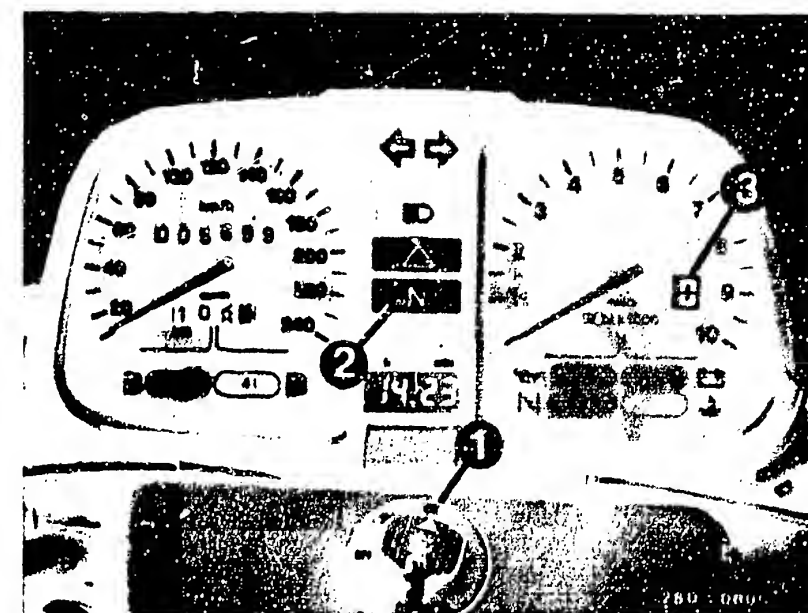
1. Set ignition key to "ON" position, i.e. ignition and all circuits on (center picture - Item 1).
2. Set emergency ignition switch to operating position (1); all circuits are active (bottom picture).  
If the switch is set to left or right (to position "0"), the engine can be switched off immediately in an emergency situation. Starting the engine is possible only in the center position (1) since, when in the left-hand or right-hand position, the emergency ignition switch breaks the circuits for ignition, fuel injection, in-tank pump and starting motor.  
The engine is started by pressing the knob (2) on the emergency ignition switch.

### Caution:

The engine may be started only if the transmission is in position "N" (see center picture, indicator lamp "N" Item 2).

At the same time, the gear indicator in the tachometer indicates a "0" (center picture - Item 3).

Shift gear only after operating the clutch.



**K22**

Important general information

BMW motorcycle

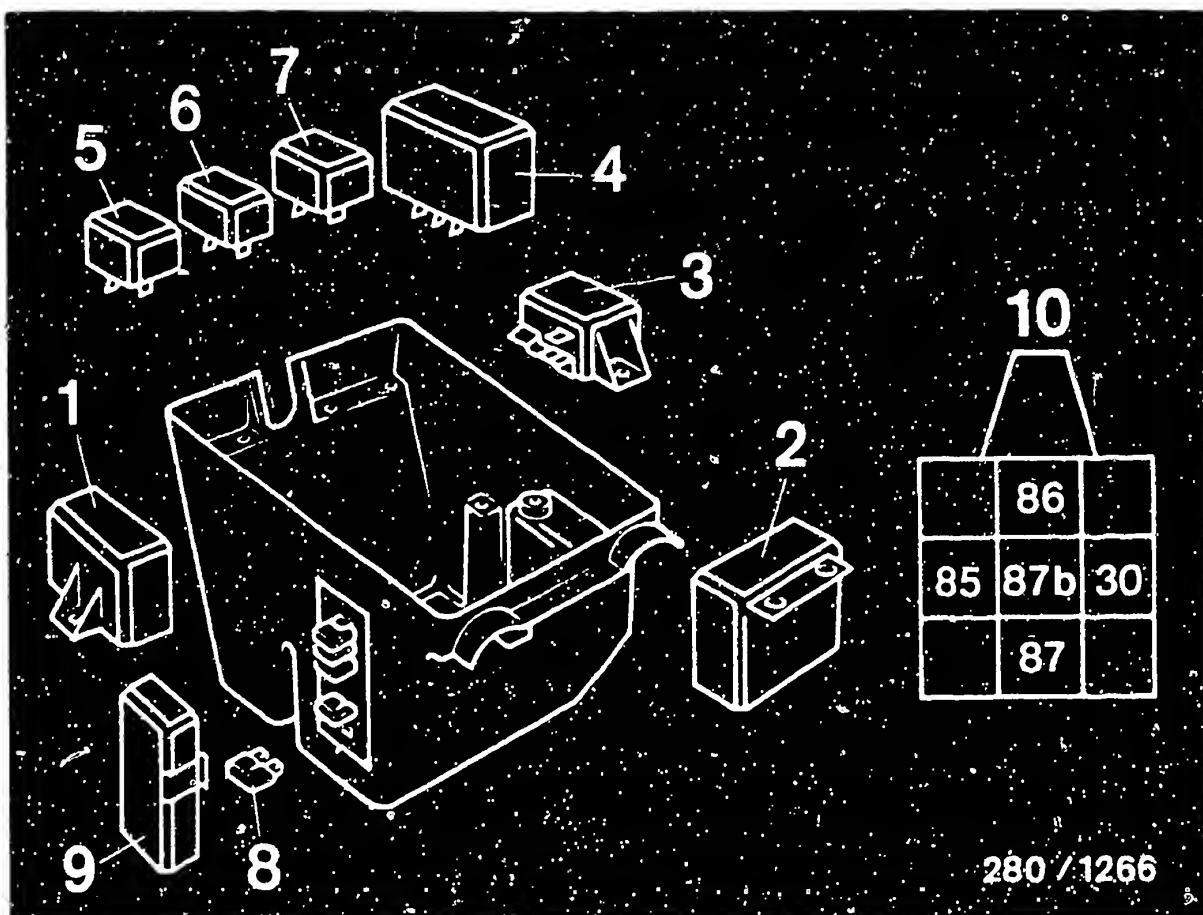


**K23**

Important general information

BMW motorcycle





- 1 = Bulb-monitoring unit
- 2 = Turn-signal and hazard-warning flasher
- 3 = Start-locking relay (starting-motor relay)
- 4 = Temperature trigger box
- 5 = Injection relay
- 6 = Fanfare/horn relay
- 7 = Electric fuel pump relay
- 8 = Fuses
- 9 = Fuse cover
- 10 = Top view of injection relay terminals

#### Layout of relays



## TABLE OF CONTENTS

| <u>Section</u>                                | <u>Coordinates</u> |
|-----------------------------------------------|--------------------|
| Special features .....                        | L 2                |
| Rapid diag.chart for the univ.test adapter .. | L 2                |
| Test specifications .....                     | L 6                |
| Electrical connection diagram .....           | L 8                |
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| Fuel line diagram .....                       | L 12               |
| Checking fuel pressure .....                  | L 14               |
| Installation position of the components ..... | L 15               |



## SPECIAL FEATURES

- Fuel filter is in the engine compartment, beneath the pressure regulator
- The solenoid-operated air valve is installed only in vehicles with automatic transmission and air conditioning
- Start control  
In the starting controls, starting enrichment takes place not via a separate electric starting valve, but via the normal electric fuel-injection valves. As a result, there are no electric starting valve and thermostats. How large the fuel-injection impulse is for the starting control depends on the following factors:
  - temperature of coolant (engine temperature)
  - engine starting speed
  - duration of the starting process

## RAPID DIAGNOSTIC CHART FOR THE UNIVERSAL TEST ADAPTER

- Use universal test adapter 0 684 101 801 and
- adapter lead 1 684 463 123.

This rapid diagnostic chart makes it possible for the experienced L-Jetronic expert to check the electrical portion of the system quickly using the universal test adapter.








The rapid diagnostic chart includes the following information

- Sequence of test steps
- Setting for the V and Q program switch
- Notes on the operation of the universal test adapter or other components.
- Test specifications for the motortester and multimeter





# Rapid diagnostic chart for the universal test adapter

| <u>Test step</u> | <u>Switch setting</u>                                                               |          | <u>Measurement</u>                                                                                                           | <u>Note</u>                                                             | <u>Test specifications (reading)</u>                        |
|------------------|-------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------|
|                  | V                                                                                   | $\Omega$ |                                                                                                                              |                                                                         |                                                             |
| 1                | 6                                                                                   | -        | Voltage from control relay Term. 87.<br>Control unit plug Term. 9 to Term. 5.                                                | Put into neutral, start engine                                          | 8 ... 15 V                                                  |
| 2                | 7                                                                                   | -        | Voltage from starting motor Term. 50.<br>Control unit plug Term. 4 to Term. 5.                                               | Put into neutral, start engine                                          | 8 ... 15 V                                                  |
| 3                |    | 11       | Resistance of the temperature sensor NTC I in the air-flow sensor Term. 8.<br>Control unit plug Term. 8 to Term. 5.          | -----                                                                   | 100 ... 200 $\Omega$                                        |
| 4                |    | 12       | Resistance of the potentiometer in the air-flow sensor Term. 7.<br>Control unit plug Term. 7 to Term. 5.                     | Deflect air-flow sensor flap as far as the stop.                        | 60 ... 1000 $\Omega$                                        |
| 5                |  | 13       | Resistance of the temperature sensor NTC II Term. 10 (engine temperature).<br>Control unit plug Term. 10 to Term. 5.         | + 15°C ... + 30°C<br>+ 80°C                                             | 1.3 ... 3.6 k $\Omega$<br>250 ... 390 $\Omega$              |
| 6                |  | 14       | Resistance ground-output stage Term. 13.<br>Control unit plug Term. 13 to Term. 5.                                           | -----                                                                   | 0 ... 10 $\Omega$                                           |
| 7                |  | 16       | Resistance of the idle contact in the throttle-valve switch Term. 2.<br>Control unit plug Term. 2 to Term. 9.                | Accelerator pedal in rest position<br>Step lightly on accelerator pedal | 0 ... 10 $\Omega$<br>∞ $\Omega$                             |
| 8                |  | 17       | Resistance of the full load contact in the throttle-valve switch Term. 3.<br>Control unit plug Term. 3 to Term. 9.           | Push accelerator pedal to floor<br>Step lightly on accelerator pedal    | 0 ... 10 $\Omega$<br>∞ $\Omega$                             |
| 9                |  | 18       | Resistance of all 4 electric fuel-injection valves connected in parallel Term. 12.<br>Control unit plug Term. 12 to Term. 9. | -----                                                                   | +20°C: 7.0 ... 9.5 $\Omega$<br>+80°C: 7.2 ... 10.0 $\Omega$ |

**L3**

Rapid diag. chart for univ. test adapter  
Citroen CX 25



**L4**

Rapid diag. chart for univ. test adapter  
Citroen CX 25



### Additional lead tests required

These leads have not been included in the rapid checking using the universal test adapter.

- From control unit plug Term. 9 to the auxiliary-air device plug Term. 9/2.
- From the control unit plug Term. 13 to the auxiliary-air device plug Term. 26.
- From the control relay Term. 28 to the electric fuel pump Term. 28
- From the electric fuel pump Term. 61 to the vehicle ground.
- From the control unit plug Term. 15 via a plug connection to the VEZ (semiconductor-ignition system) control unit plug white Term. 1.  
(Installation position for the VEZ control unit: in the glove compartment on the passenger's side).





## TEST SPECIFICATIONS

### Pressure regulator

- Fuel pressure: 2.3 ... 2.7 bar

### Electric fuel pump

- Delivery at the return: min. 750 cm<sup>3</sup>/30s
- Connection voltage under load: min. 12 V

### Auxiliary-air device

- Internal electrical resistance 40 ... 75  $\Omega$

### Temperature sensor II (engine)

- Internal electrical resistance at ambient temperature (+15°C...+30°C): 1.45 ... 3.3 k $\Omega$   
engine at normal operating temp. (approx. +80°C): 280 ... 360  $\Omega$

### Air-flow sensor

- Resistance between:  
Term. 8 and Term. 5: 340 ... 450  $\Omega$   
Term. 7 and Term. 5: (deflect air-flow sensor flap all the way) 60 ... 1000  $\Omega$   
Term. 9 and Term. 5: 500 ... 760  $\Omega$   
Term. 8 and Term. 9: 160 ... 300  $\Omega$

### Electric fuel-injection valve

- Internal electrical resistance at +20°C: 15.0 ... 17.5  $\Omega$



Idle adjustment (engine at normal operating temperature,  
approx. + 80°C)

● Idle speed

Manual transmission (without air  
conditioner)

750 ... 800 min<sup>-1</sup>

with air conditioner

800 ... 850 min<sup>-1</sup>

Automatic transmission  
(in "Park")

without air conditioner:

750 ... 800 min<sup>-1</sup>

with air conditioner:

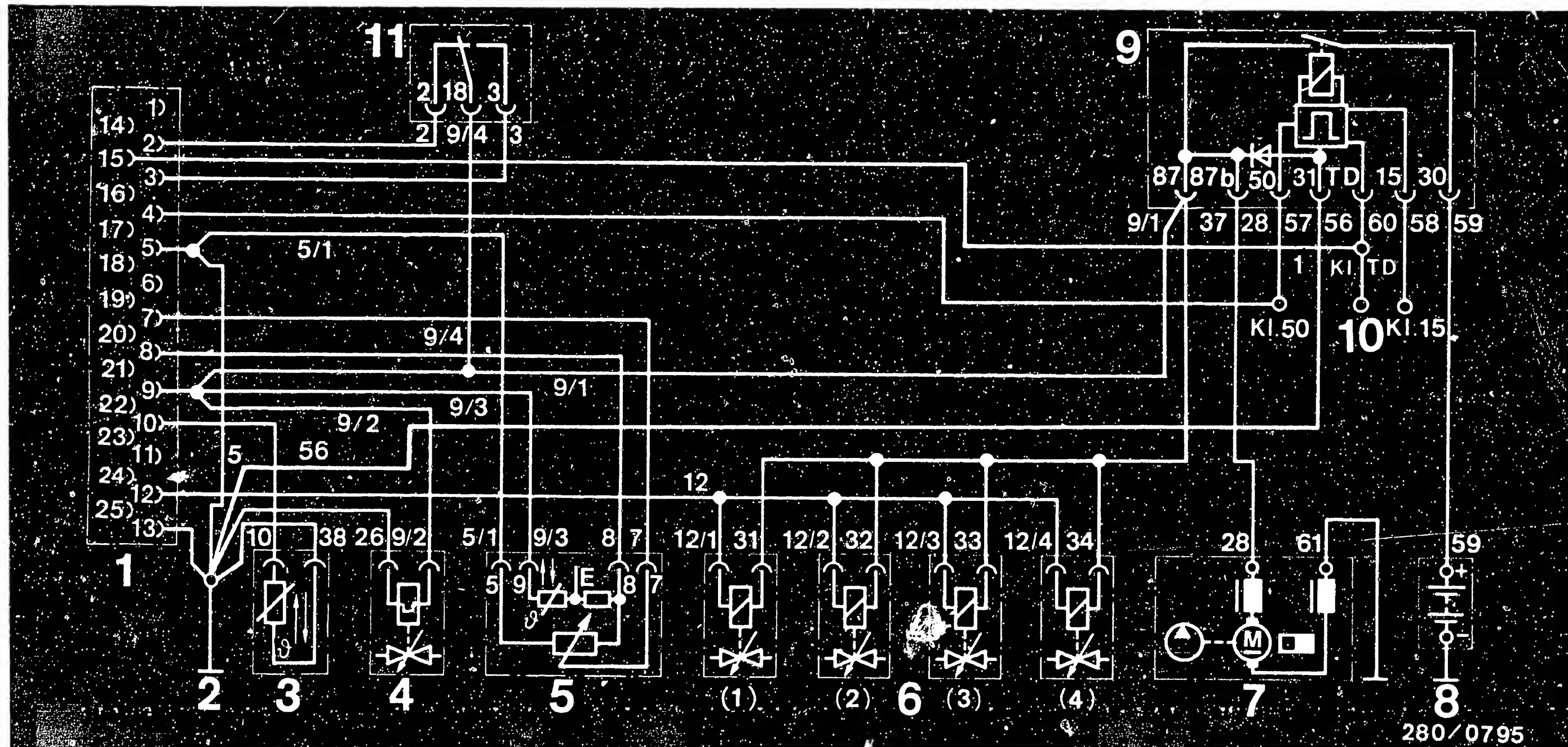
800 ... 850 min<sup>-1</sup>

● CO-adjustment

0.8 ... 1.5 vol% CO

For setting values for ignition, valve clearance, and  
other engine data, see the Equipment and Auto Data  
microfiche.





Electrical connection diagram

- 1 = Control unit plug
- 2 = Central ground
- 3 = Temperature sensor II (engine)
- 4 = Auxiliary-air device

- 5 = Air-flow sensor
- 6 = Electric fuel-injection valves
- 7 = Electric fuel pump
- 8 = Battery

- 9 = Control relay
- 10 = to the VEZ control unit
- 11 = Throttle-valve switch

**L8**

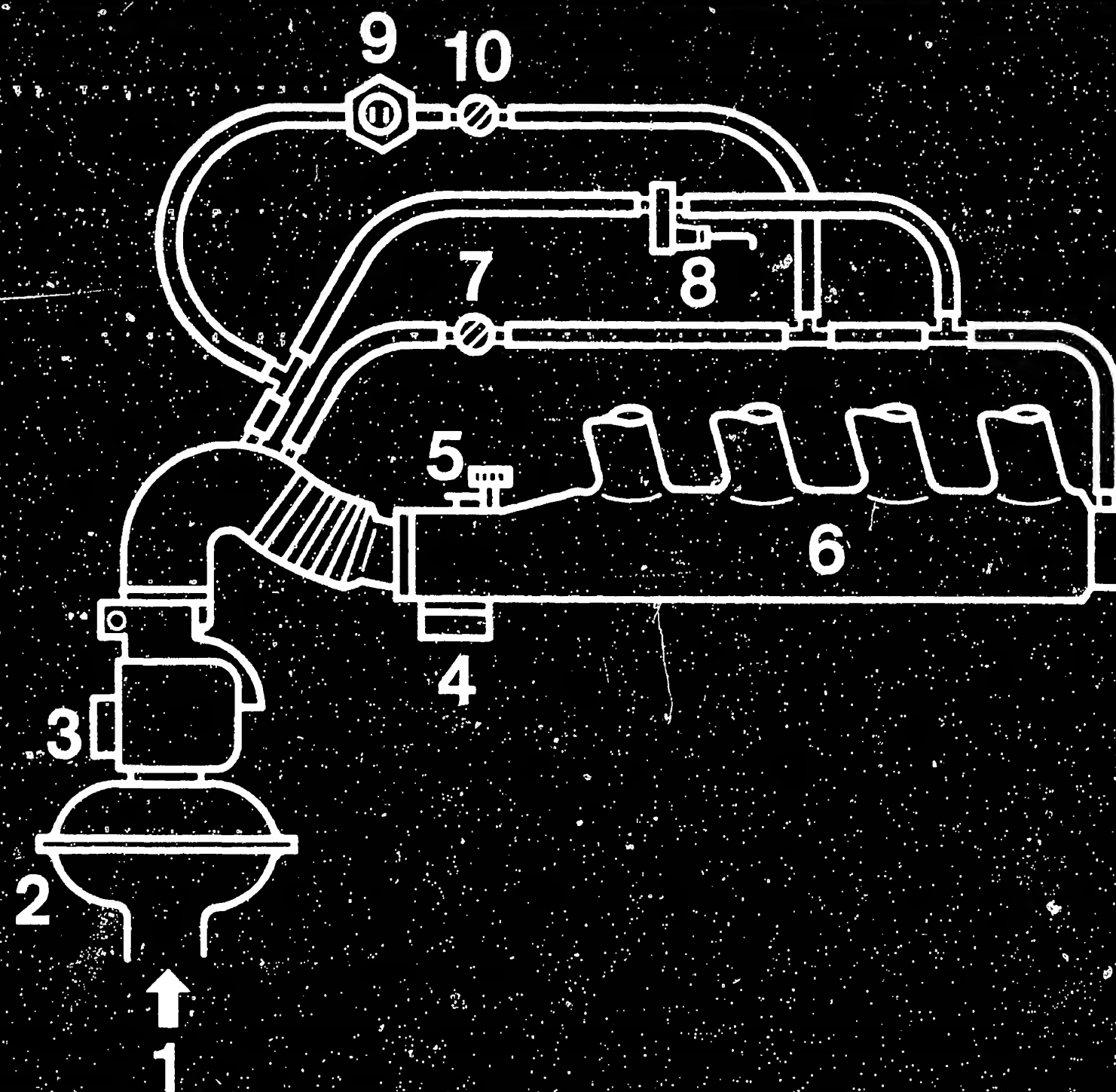
Electrical connection diagram  
Citroen CX 25



**L9**

Electrical connection diagram  
Citroen CX 25





280/0796

Diagram of air hoses

- 1 = Air inlet
- 2 = Air filter
- 3 = Air-flow sensor
- 4 = Throttle-valve switch

- 5 = Throttle-valve adjustment  
eccentric
- 6 = Intake manifold
- 7 = Idle-air screw

- 8 = Auxiliary-air device
- 9 = Solenoid-operated air valve;  
installed only with air conditioner
- 10 = Air adjusting screw for No. 9

**L10**

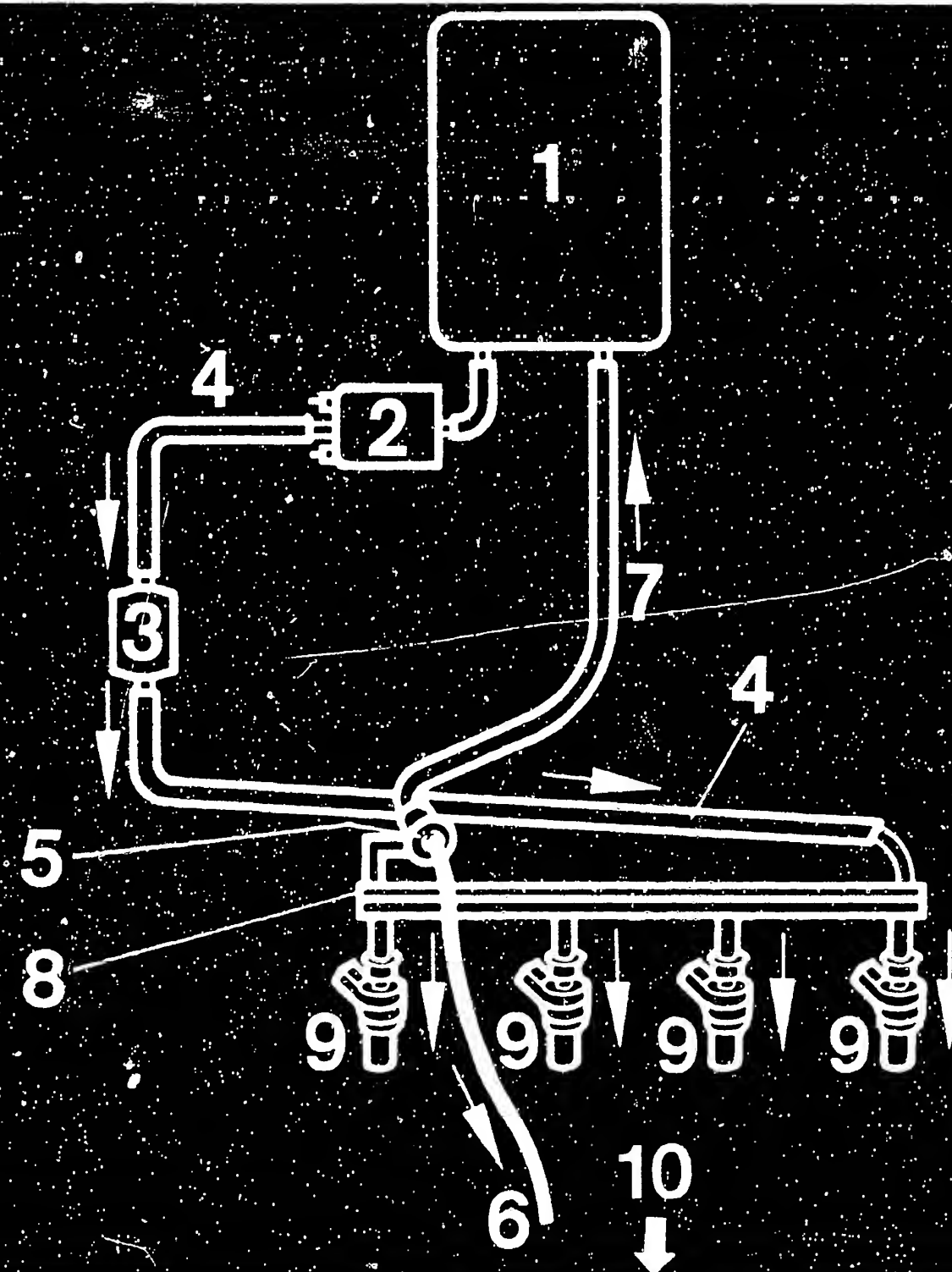
Air hose diagram  
Citroen CX 25



**L11**

Air hose diagram  
Citroen CX 25





280/0797

Fuel line diagram

1 = Fuel tank  
2 = Electric fuel pump  
3 = Fuel filter  
4 = Fuel delivery line

5 = Pressure regulator  
6 = to intake manifold  
7 = Fuel return line  
8 = Fuel distributor

9 = Electric fuel-injection valves  
10 = Direction of forward travel  
Arrows = Direction of fuel flow

**L12**

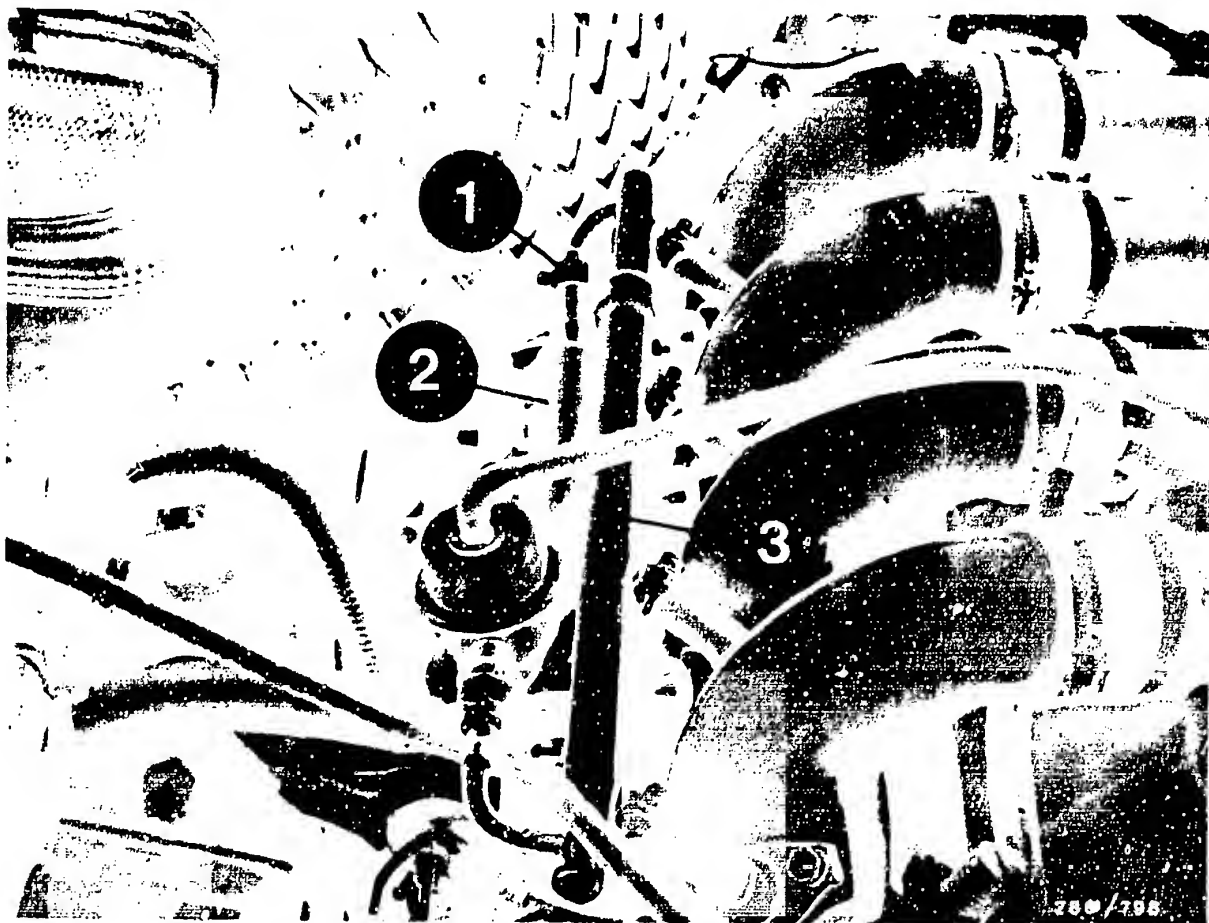
Fuel line diagram  
Citroen CX 25



**L13**

Fuel line diagram  
Citroen CX 25





- 1 = Connect pressure gauge (1 687 231 154) at this point
- 2 = Fuel pressure hose
- 3 = Fuel distributor

### Checking fuel pressure

Connect pressure gauge between the fuel pressure hose and the fuel distributor.

N. B.:

When removing the fuel hose, make certain that no fuel gets onto hot parts of the engine.





### Installation position of the components

Indications for installation position are always given looking in the direction of forward travel.

Control unit: The control unit is behind a cover at the left in the driver's footwell.

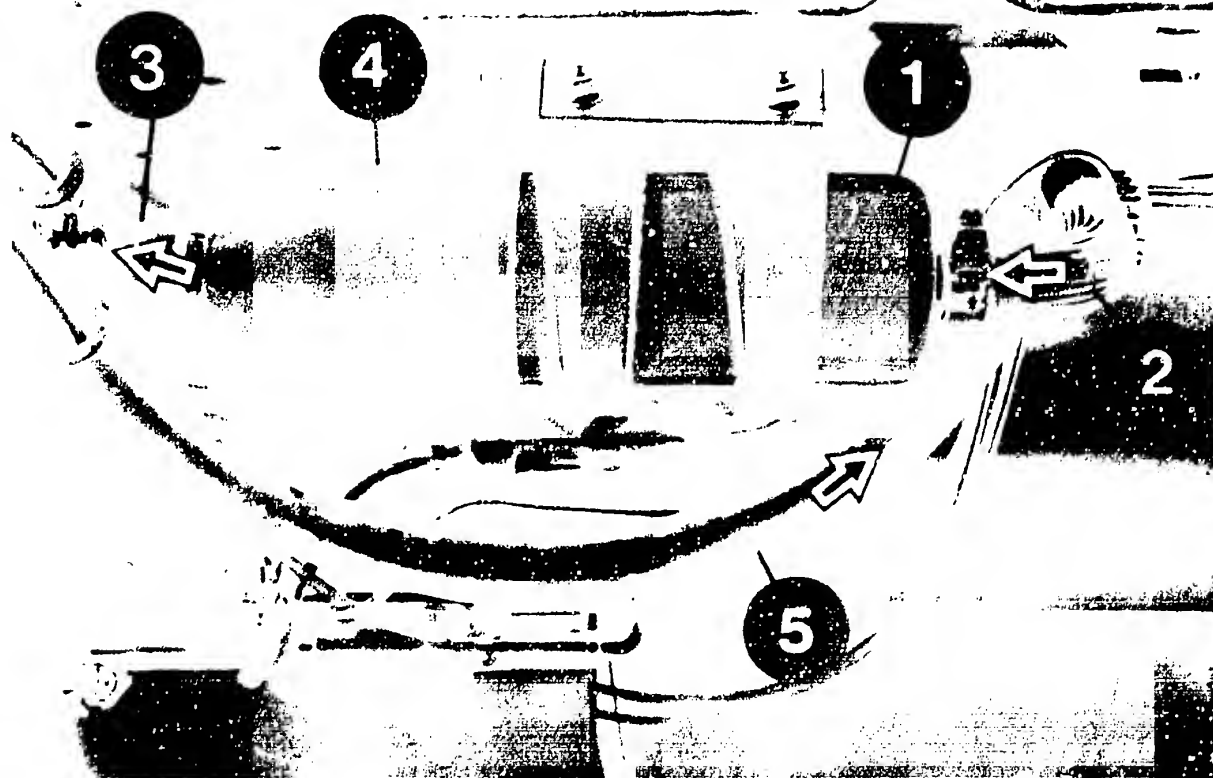
Checking: The control unit plug is accessible through the opening (arrow 1).

Release the lock by finger pressure on the spring in the direction shown by arrow 2.

Remove plug by turning in the direction shown by arrow 3.

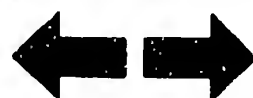




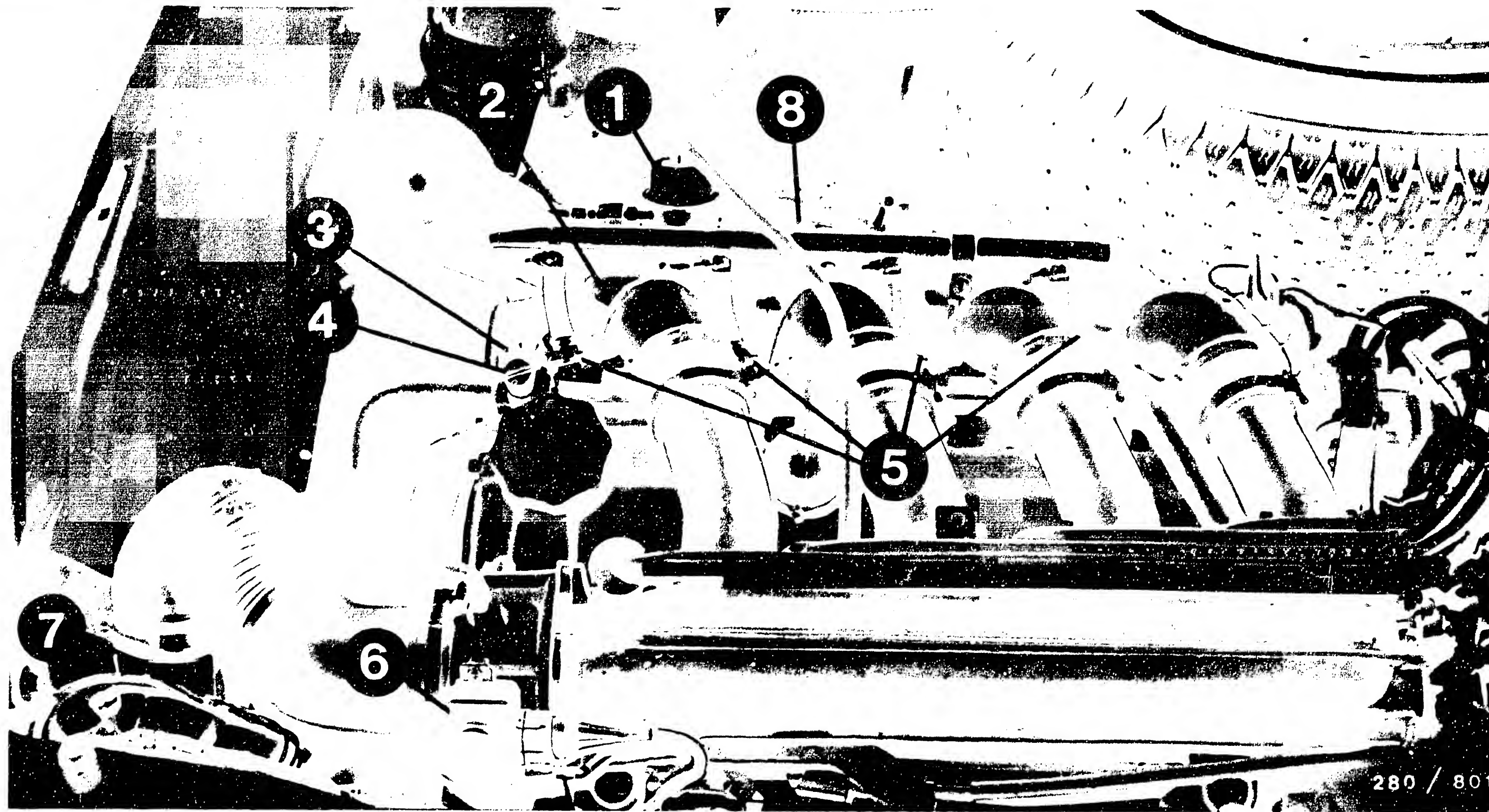


- 1 = Electric fuel pump
- 2 = Fuel suction line
- 3 = Fuel delivery line
- 4 = Rubber cap (electrical connections under this)
- 5 = Fuel return line
- Arrow= direction of fuel flow

The installation position for the electric fuel pump is in a rubber mounting on the right in front of the rear axle (cross-beam).







280 / 801

Installation positions of the components (continued)

1 = Pressure regulator

2 = Fuel filter

3 = Temperature sensor II (blue)  
(engine)

4 = Idle-adjustment screw

5 = Electric fuel-injection valves

6 = Throttle-valve switch

7 = Air-flow sensor

8 = Auxiliary-air device

**L17**

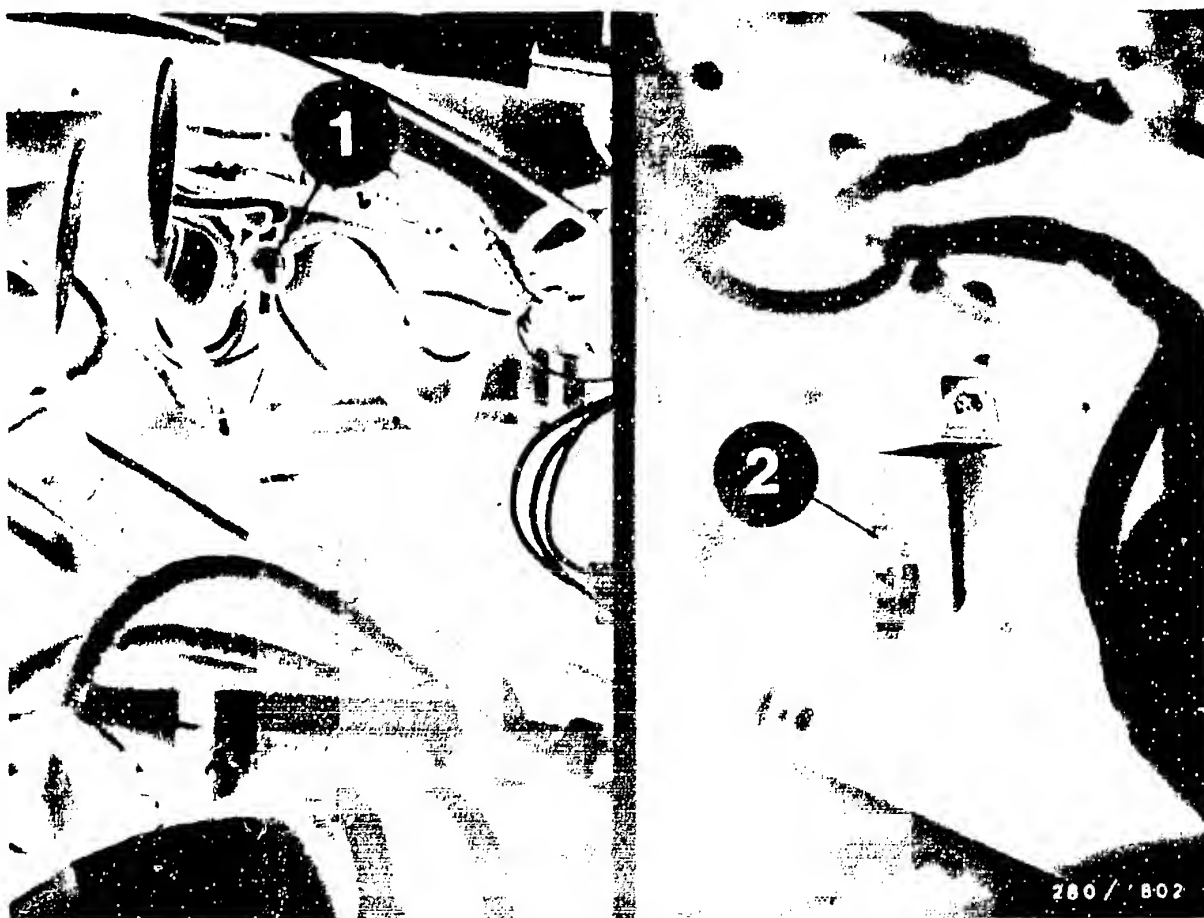
Installation position of the components  
Citroën CX 25



**L18**

Installation position of the components  
Citroën CX 25





- 1 = Central ground  
2 = Control relay

The control relay (blue) sits to the left of the left headlight.



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## Section

## Coordinates

|                                                          |      |
|----------------------------------------------------------|------|
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| Rapid diagnosis chart for<br>universal test adapter..... | M 3  |
| Test specifications.....                                 | M 8  |
| Electrical terminal diagram.....                         | M 10 |
| Diagram of air lines.....                                | M 12 |
| Diagram of fuel lines.....                               | M 14 |
| Fuel pressure test.....                                  | M 16 |
| Installation position of components.....                 | M 17 |



- Special features

- L-Jetronic with control unit 0 280 000 224
- Solenoid-operated injection valves with O-ring
- Fuel filter under the vehicle, near the electric fuel pump
- Also solenoid-operated air valve if air conditioner installed
- Ignition and knock control unit (non-Bosch product)
- Exhaust turbo-supercharger

- Remarks

The L-Jetronic in the Citroen CX 25 Turbo is basically the same as that in the Citroen CX 2400.

- Similar SIS repair manual:  
Microcard SIS-KH/VDT-CIT-500 of 8.84.



## 6 RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

Universal test adapter  
and adapter lead

0 684 101 801  
1 684 463 129

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system using the universal test adapter.

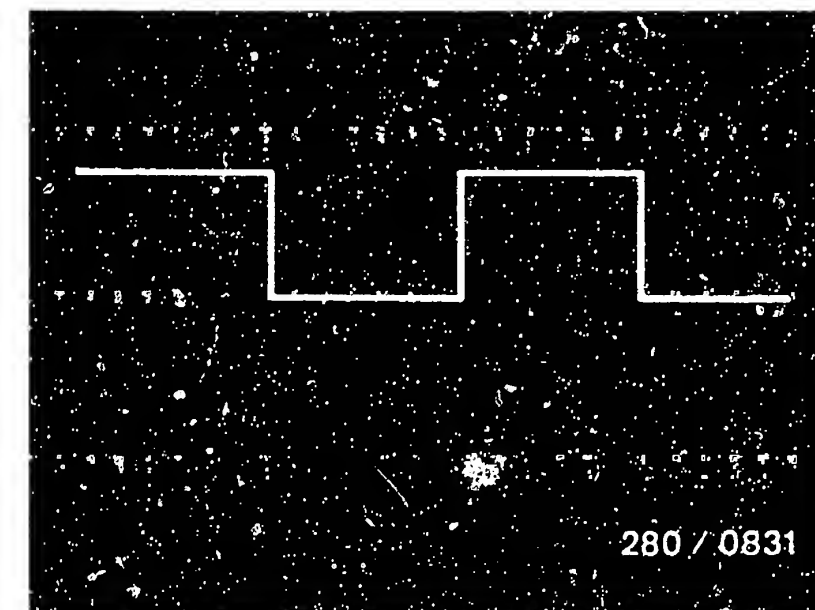
The rapid diagnosis chart contains the following information

- Switch settings on the universal test adapter
- Sequence of test steps
- Notes on how to operate the universal test adapter or other components
- Readings on the multimeter
- References to coordinates of the respective detailed testing and trouble-shooting program.



# Rapid diagnosis chart for universal test adapter

| Test step | Switch position |          | Measurement and remarks                                                                                                                                              | Test specifications (reading) |
|-----------|-----------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|           | V               | $\Omega$ |                                                                                                                                                                      |                               |
| 1         | 3               | -        | Shift gear to neutral and start.<br>Voltage from starting motor Term. 50<br>At control unit plug between Term. 4 and Term. 5                                         | 8 ... 15 V                    |
| 2         | 4               | -        | Shift gear to neutral and start.<br>Voltage supply from control relay Term. 87 through the auxiliary-air device<br>At control unit plug between Term. 34 and Term. 5 | 8 ... 15 V                    |
| 3         | 5               | -        | Shift gear to neutral and start.<br>TD signal from AEI ignition trigger box Term. B1<br>At control unit plug between Term. 1 and Term. 5                             | see top diagram               |
| 4         | 6               | -        | Ignition "ON".<br>Voltage from auxiliary relay Term. 87b<br>At control unit plug between Term. 10 and Term. 5                                                        | 8 ... 15 V                    |
| 5         | 7               | -        | Ignition "ON"<br>Voltage from 1st injection valve Term. 15<br>At control unit plug between Term. 15 and Term. 5                                                      | 8 ... 15 V                    |
| 6         | 8               | -        | Ignition "ON"<br>Voltage from 2nd injection valve Term. 33<br>At control unit plug between Term. 33 and Term. 5                                                      | 8 ... 15 V                    |
| 7         | 9               | -        | Ignition "ON"<br>Voltage from 3rd injection valve Term. 32<br>At control unit plug between Term. 32 and Term. 5                                                      | 8 ... 15 V                    |
| 8         | 10              | -        | Ignition "ON"<br>Voltage from 4th injection valve Term. 14<br>At control unit plug between Term. 14 and Term. 5                                                      | 8 ... 15 V                    |
| 9         | 12              | -        | Ignition "ON"<br>Voltage from auxiliary relay Term. 87<br>At control unit plug between Term. 29 and Term. 5                                                          | 8 ... 15 V                    |



TD signal  
(approx 10 V amplitude)

**M4**

Rapid diagnosis chart  
Citroen GTi Turbo












**M5**

Rapid diagnosis chart  
Citroen GTi Turbo



# Rapid diagnosis chart for universal test adapter

| Test step | Switch position                                                                     |          | Measurement and remarks                                                                                                      | Remarks                                                               | Test specifications (reading)                                                  |
|-----------|-------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------|
|           | V                                                                                   | $\Omega$ |                                                                                                                              |                                                                       |                                                                                |
| 10        |    | 6        | Resistance of potentiometer (wiper in air-flow sensor).<br>At control unit plug between Term. 7 and Term. 5                  | Deflect air-flow sensor flap as far as it will go.                    | 80 ... 600 $\Omega$                                                            |
| 11        |    | 7        | Resistance of potentiometer (total resistance) in air-flow sensor.<br>At control unit plug between Term. 8 and Term. 5       | -----                                                                 | 260 ... 520 $\Omega$                                                           |
| 12        |    | 8        | Series resistance and total potentiometer resistance in air-flow sensor.<br>At control unit plug between Term. 9 and Term. 5 | -----                                                                 | 400 ... 800 $\Omega$                                                           |
| 13        |   | 9        | Resistance of idle contact in throttle-valve switch.<br>At control unit plug between Term. 2 and Term. 18.                   | Accelerator in rest position:<br><br>Accelerator slightly depressed:  | 0 ... 10 $\Omega$<br><br>$\infty \Omega$                                       |
| 14        |  | 10       | Resistance of full-load contact in throttle-valve switch.<br>At control unit plug between Term. 3 and Term. 18               | Accelerator in full-load position:<br>Accelerator slightly depressed: | 0 ... 10 $\Omega$<br><br>$\infty \Omega$                                       |
| 15        |  | 11       | Resistance of temperature sensor NTC I in air-flow sensor<br>At control unit plug between Term. 27 and Term. 5               | -----                                                                 | at +15°C...+30°C<br>1.45...3.3 k $\Omega$<br>at +80°C:<br>220 ... 360 $\Omega$ |
| 16        |  | 12       | Resistance of temperature sensor NTC II (engine temperature)<br>Control unit plug between Term. 13 and Term. 5               | -----                                                                 | at +15°C...+30°C:<br>1.3 ... 3.6 k $\Omega$<br>at +80°C:<br>250...390 $\Omega$ |
| 17        |  | 13       | Resistance of output stage - ground<br>At control unit plug between Term. 13 and Term. 5                                     | -----                                                                 | 0 ... 10 $\Omega$                                                              |
| 18        |  | 14       | Resistance of output stage - ground<br>At control unit plug between Term. 17 and Term. 5                                     | -----                                                                 | 0 ... 10 $\Omega$                                                              |

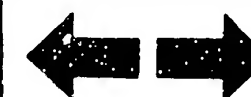
**M6**

Rapid diagnosis chart  
Citroen GTi Turbo



**M7**

Rapid diagnosis chart  
Citroen GTi Turbo





## TEST SPECIFICATIONS

### Idle speed

Manually-shifted transmission: 800 ... 850 min<sup>-1</sup>

Automatic transmission (selector lever in position "N" and hand-brake on): 800 ... 850 min<sup>-1</sup>

### Exhaust-gas setting, CO concentration

(with engine at op. temp.) 0.8 ... 1.2 % by vol. CO

### Fuel pressure

2.3 ... 2.7 bar

### Fuel pump delivery:

min. 800 cm<sup>3</sup>/30 s

### Injection valve

Electrical internal resistance: 2.0 ... 3.0 Ω

### Temperature sensors

Electrical internal resistance:

|                                              | NTC I (air)   | NTC II (engine) |
|----------------------------------------------|---------------|-----------------|
| Ambient temperature (approx +15°C... +30°C): | 1.45...3.3 kΩ | 1.3...3.6 kΩ    |
| Engine at op. temp. (approx +80°C):          | 280...360 Ω   | 250...390 Ω     |

### Start valve

Electrical internal resistance: 3.5 ... 4.5 Ω

### Auxiliary-air device

Electrical internal resistance: 35 ... 70 Ω





### Thermo-time switch

Electrical internal resistance:

|                                   | between<br>Term. "G" +<br>ground | between<br>Term. "W" +<br>ground | between<br>Term. "G"<br>+ "W" |
|-----------------------------------|----------------------------------|----------------------------------|-------------------------------|
| Ambient temperature (below +30°C) | 25...40 $\Omega$                 | 0 $\Omega$                       | 25...40 $\Omega$              |
| Engine at op. temp. (above +40°C) | 50...80 $\Omega$                 | 100...<br>160 $\Omega$           | 50...80 $\Omega$              |

### Air-flow sensor

Electrical internal resistance

|                    |                         |
|--------------------|-------------------------|
| Term. 6 to Term. 9 | 400 ... 800 $\Omega$    |
| Term. 6 to Term. 8 | 260 ... 580 $\Omega$    |
| Term. 8 to Term. 9 | 140 ... 280 $\Omega$    |
| Term. 6 to Term. 7 | 80 ... 600 $\Omega$ *   |
| Term. 7 to Term. 8 | 200 ... 1000 $\Omega$ * |

\* Reading changes when air-flow sensor flap is deflected

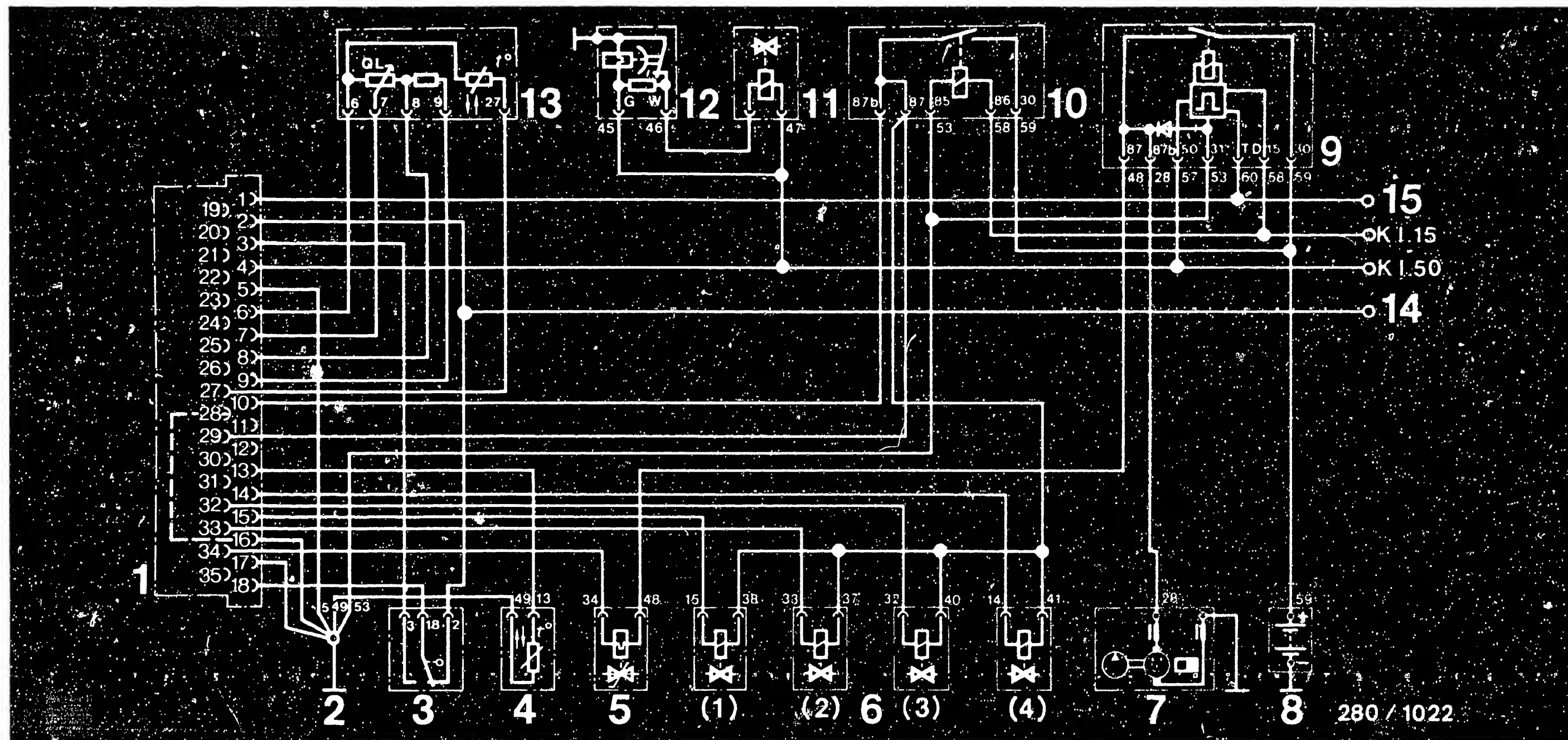
### Turbocharger

Charge-air pressure  
as of 2000 min

0.4 bar

See equipment and Autodata microfiches for settings for ignition, valve clearance and other engine data.





Electrical terminal diagram

- |                                          |                          |                         |                                                              |
|------------------------------------------|--------------------------|-------------------------|--------------------------------------------------------------|
| 1 = Control unit plug                    | 5 = Auxiliary-air device | 9 = Control relay       | 13 = Air-flow sensor                                         |
| 2 = Central ground                       | 6 = Injection valves     | 10 = Auxiliary relay    | 14 = AEI control unit (ignition) Term. 4 (non-Bosch product) |
| 3 = Throttle-valve switch                | 7 = Electric fuel pump   | 11 = Start valve        | 15 = Term. TD AEI control unit Term. B1                      |
| 4 = Engine temperature sensor II (white) | 8 = Battery              | 12 = Thermo-time switch |                                                              |

M10

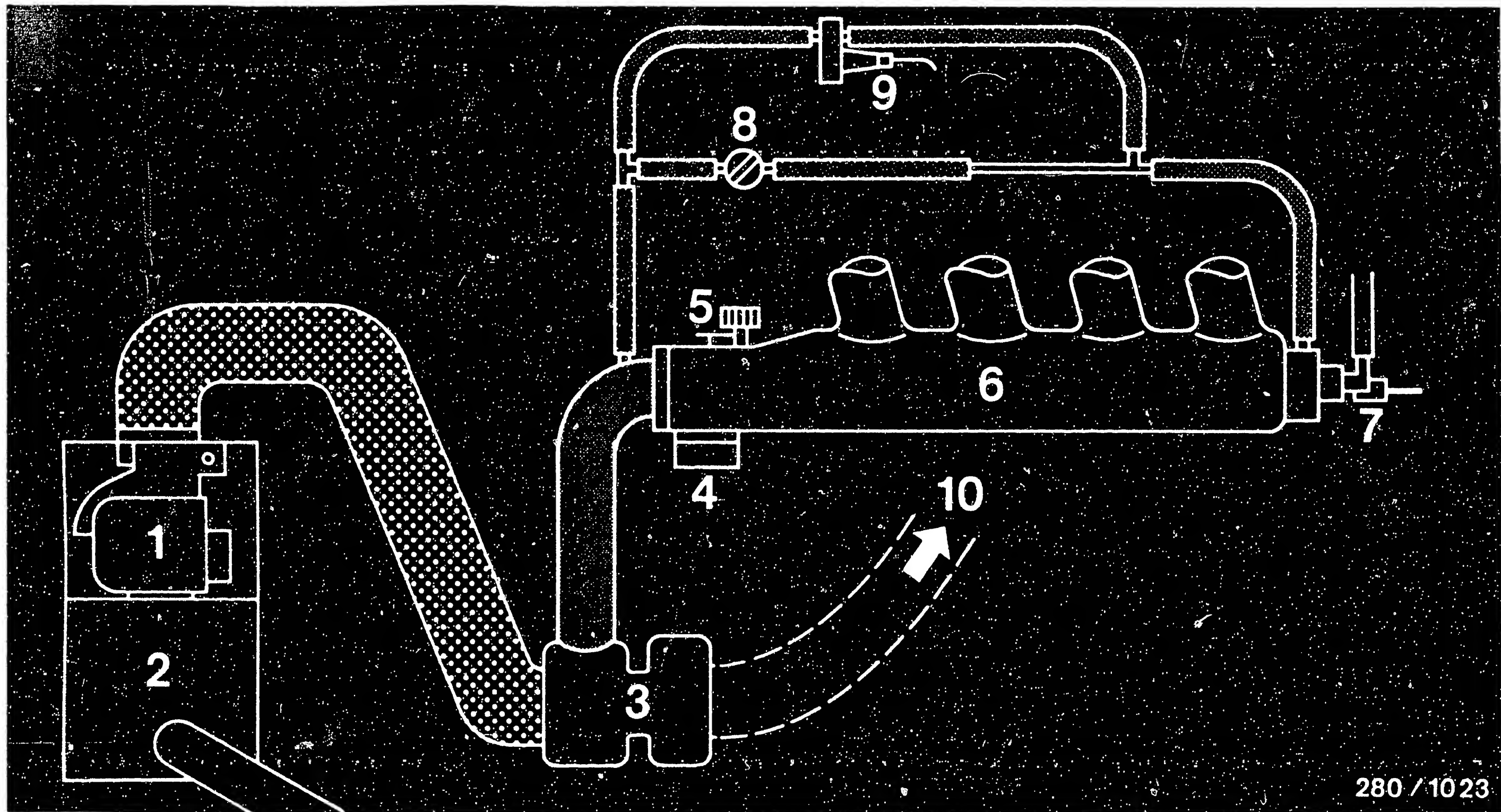
Electrical terminal diagram  
Citroen GTi Turbo



M11

Electrical terminal diagram  
Citroen GTi Turbo







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Diagram of air lines

- 1 = Air-flow sensor
- 2 = Air filter
- 3 = Turbocharger
- 4 = Throttle-valve switch

- 5 = Throttle-valve adjusting eccentric
- 6 = Intake manifold
- 7 = Start valve
- 8 = Idle-air screw

- 9 = Auxiliary-air device
- 10 = Exhaust
-  Air before turbocharger
-  Air after turbocharger

**M12**

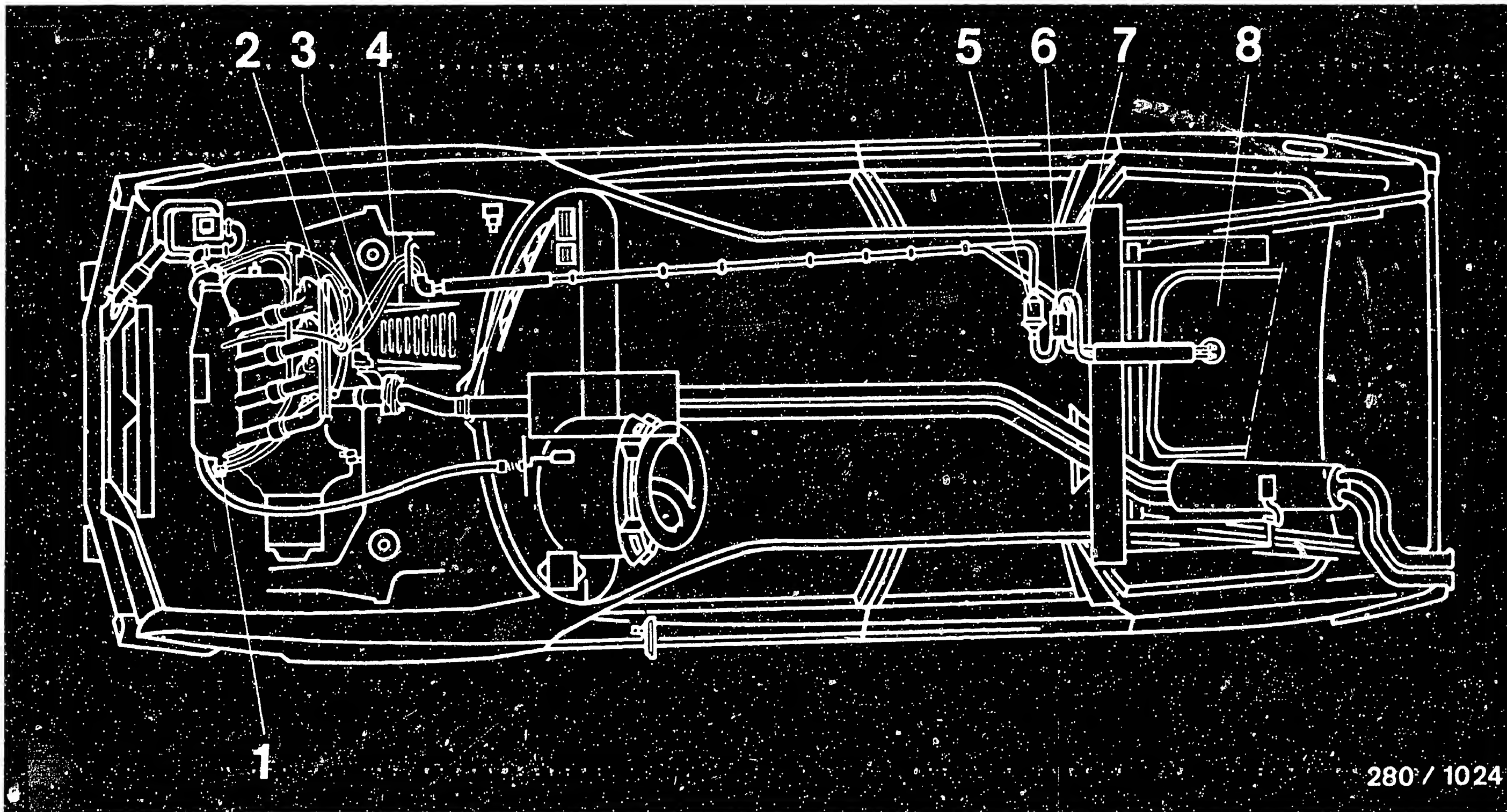
Diagram of air lines  
Citroen GTi Turbo



**M13**

Diagram of air lines  
Citroen GTi Turbo





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Diagram of fuel lines

- 1 = Start valve
- 2 = Pressure regulator
- 3 = Fuel return line

- 4 = Fuel delivery line
- 5 = Fuel filter
- 6 = Electric fuel pump

- 7 = Fuel intake line
- 8 = Fuel tank

**M14**

Diagram of fuel lines  
Citroen GTi Turbo



**M15**

Diagram of fuel lines  
Citroen GTi Turbo





- 1 = Connect pressure gauge (1 687 231 154) at this point
- 2 = Fuel delivery hose
- 3 = Fuel-distribution pipe

#### Fuel pressure test

Connect pressure gauge between fuel delivery hose and fuel-distribution pipe.

#### Caution:

When removing the fuel hose, make sure that no fuel gets on to hot parts of the engine.





### Installation position of components

The indications "right" and "left" always refer to the forward direction of travel

Control unit: The control unit is in the left-hand driver's footwell behind a cover.

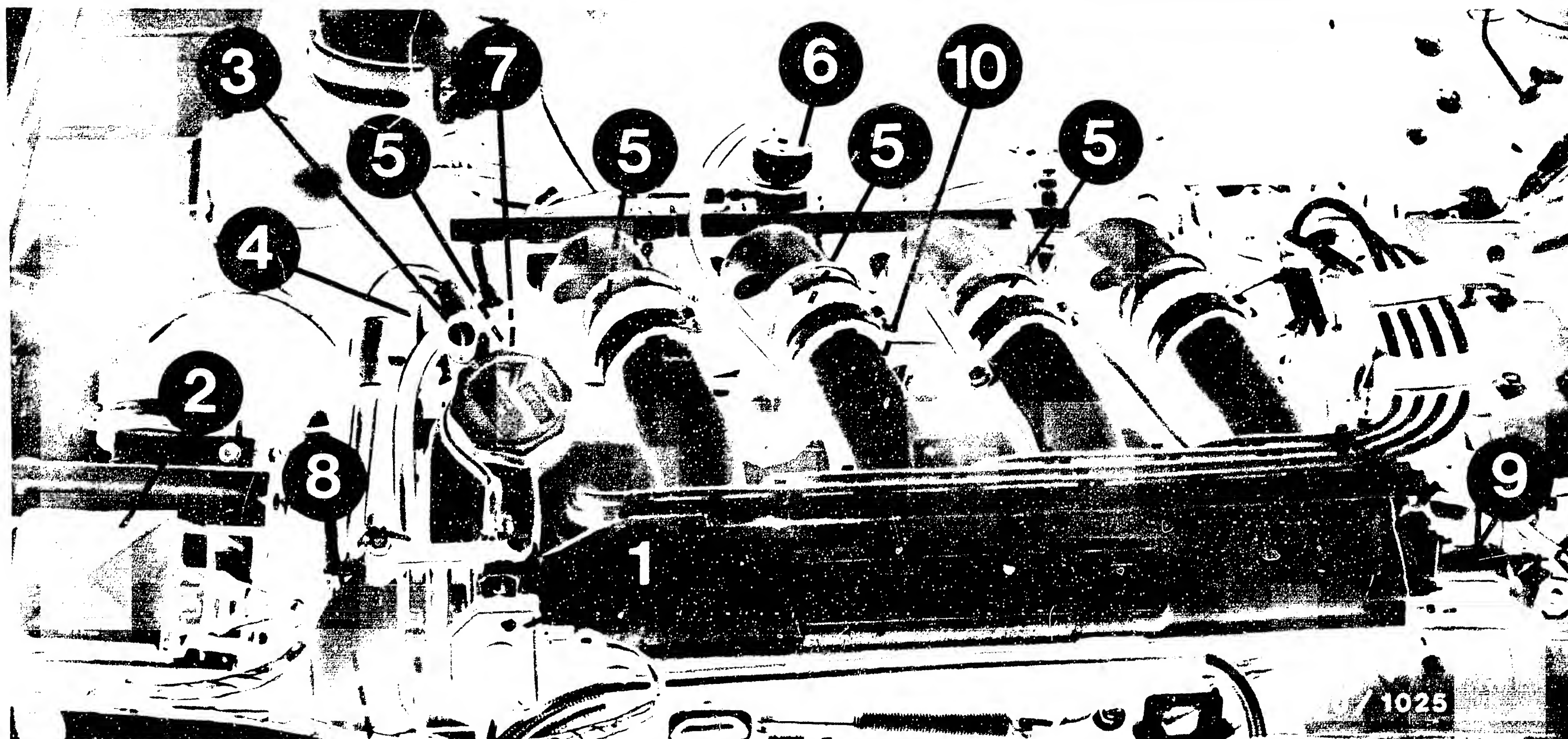
Testing: The control unit plug is accessible through the opening (1).

Locking by means of pressing finger on spring.  
Pull off plug downwards.

Arrows indicate the screws which must be loosened in order to be able to take off the cover.







# Installation position of components (continued)

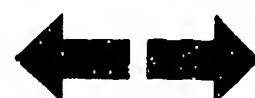
- 1 = Throttle-valve switch
- 2 = Air-flow sensor
- 3 = Idle-adjusting screw
- 4 = Temperature sensor II (white)

- 5 = Injection valves
- 6 = Pressure regulator
- 7 = Thermo-time switch (brown)
- 8 = Turbocharger

- 9 = Start valve
- 10 = Auxiliary-air device

**M18**

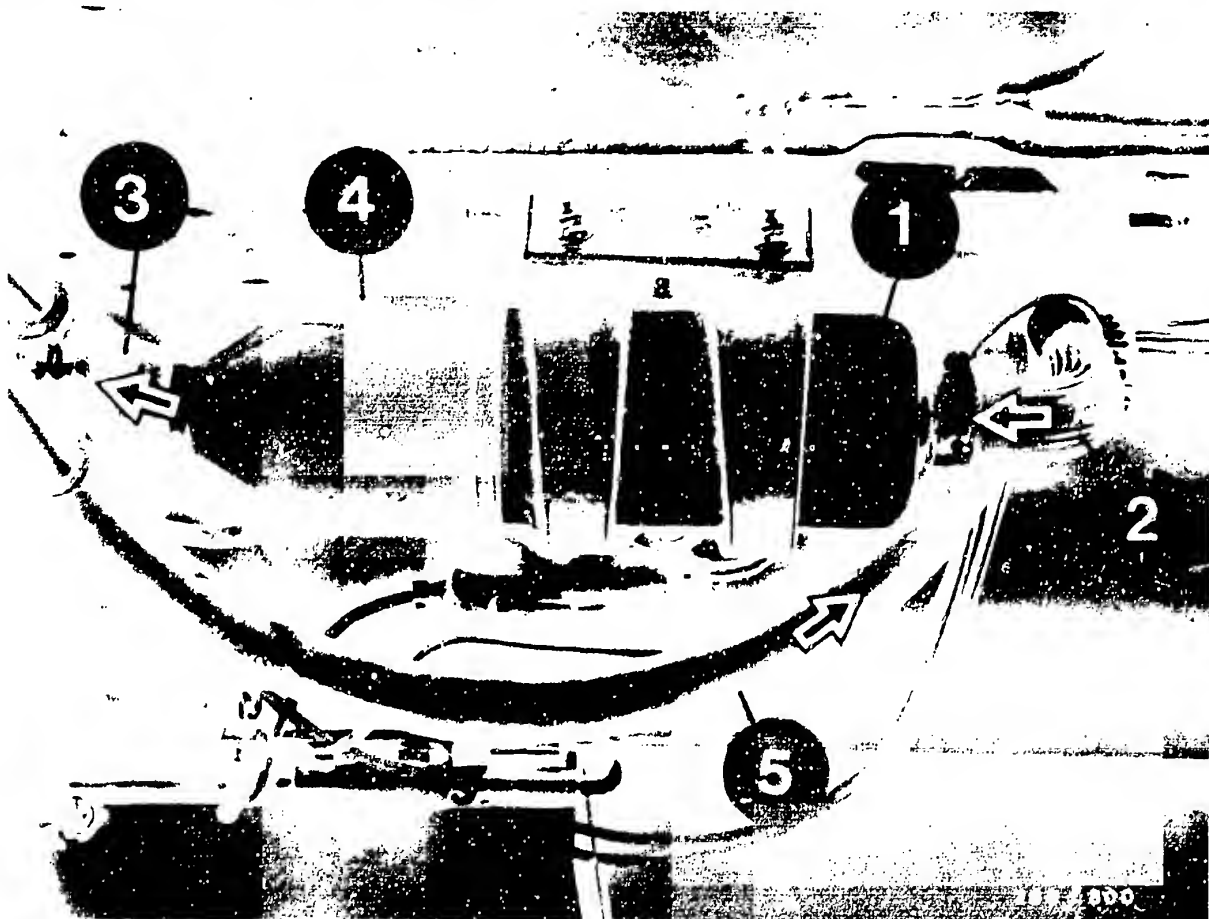
Installation position of components  
Citroen GTi Turbo



**M19**

Installation position of components  
Citroen GTi Turbo





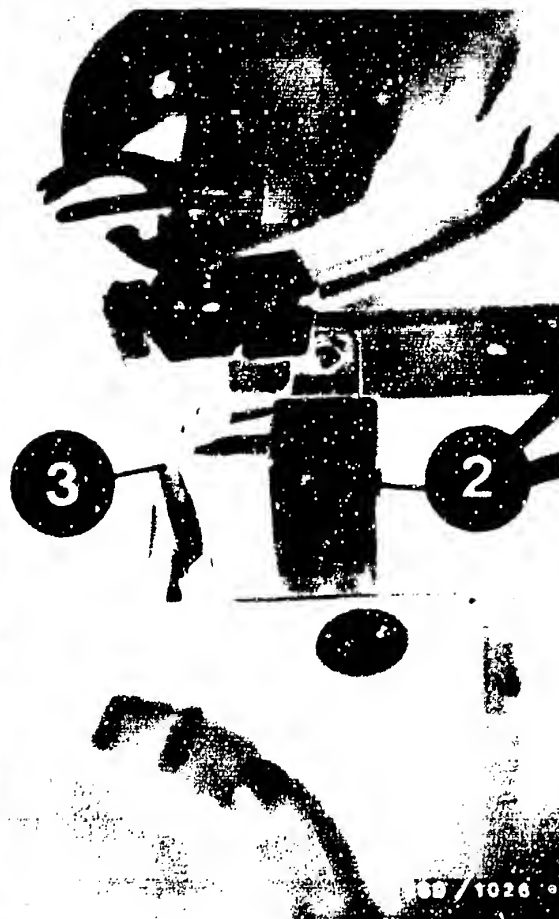
- 1 = Electric fuel pump
- 2 = Fuel intake line
- 3 = Fuel delivery line
- 4 = Rubber cap (over electrical connections)
- 5 = Fuel return line
- Arrow = Direction of fuel flow

The installation position of the electric fuel pump is in front of the rear axle (cross-member) on the right in a rubber bracket.

The picture shows the installation position on the CX 25 with naturally aspirated engine. On the turbocharged engine there is also the fuel filter.



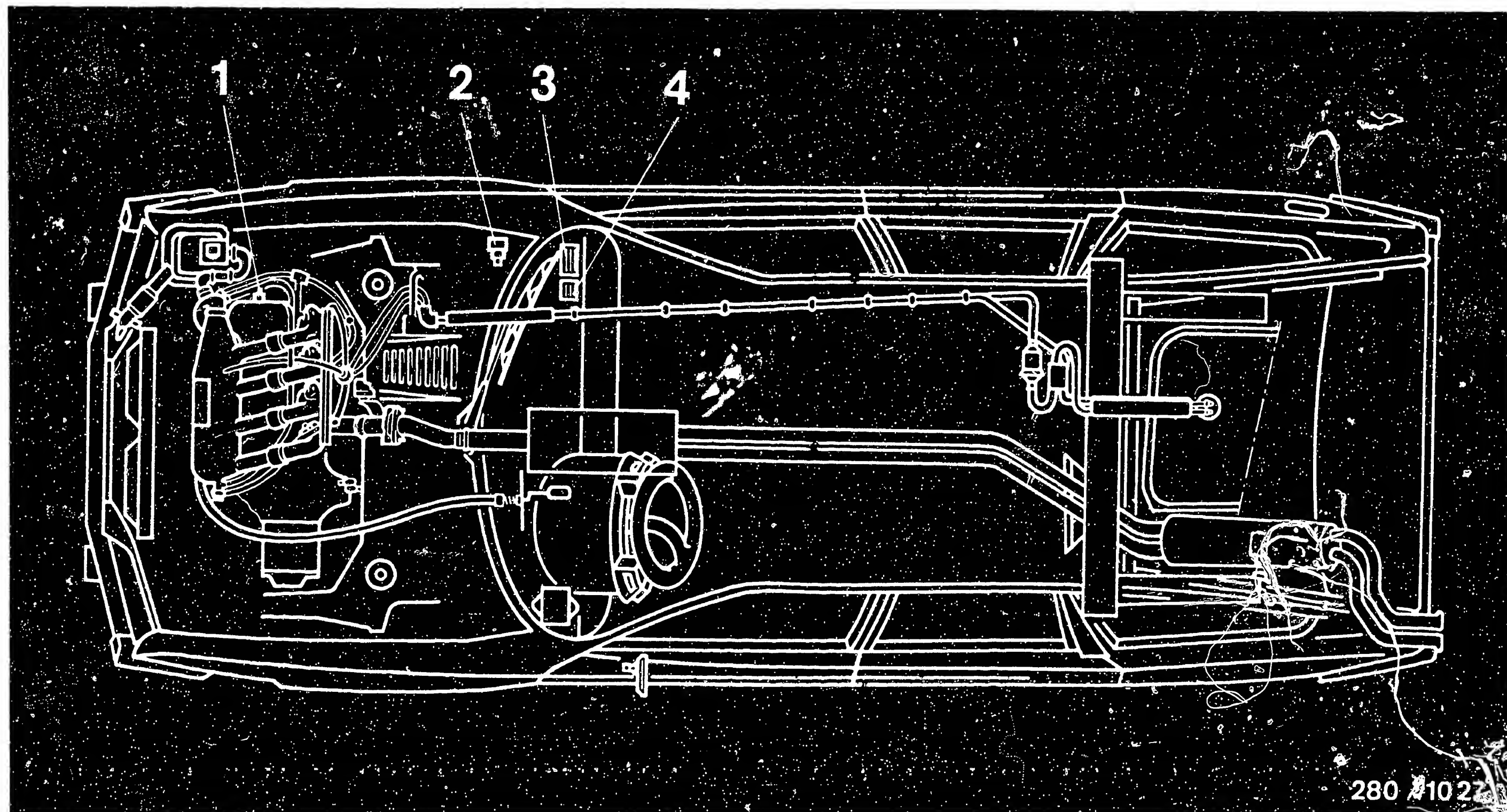




- 1 = Central ground
- 2 = Control relay
- 3 = Auxiliary relay

The control relay (blue) is situated to the left of the left-hand headlamp; the auxiliary relay (green) is to its left.





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Installation position of components (continued) special features (non-Bosch products)

1 = Knock sensor  
2 = Absolute-pressure box

3 = Knock control unit  
4 = Ignition trigger box

**M22**

Installation position of components  
Citroën GTi Turbo



**M23**

Installation position of components  
Citroën GTi Turbo

